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Prices and Propaganda

THE electrical industry will heartily welcome the decision of the Post Office to adopt a bold and generous policy to expand the telephone service. Substantial reductions are to come into force in October next which will cost £750,000 this year and £1,500,000 in a full year. But these reductions and a number of other concessions affecting both the private and the business user will bring so many new customers on to the service that the generous policy will soon be more than justified. The official list of the concessions shows a desire to meet the cases of both residential and business subscribers and to reduce grounds for irritation.

Such a statement as Sir Kingsley Wood was able to make to radio listeners after the Parliamentary proceedings last week was long overdue. Those who have studied our telephonic position closely have known that for many modest households the telephone had come to be regarded as more or less a luxury at the old rates. It was not a surprise to such people to learn that only 500,000 out of 4,500,000 householders are at present on the telephone, and that compared with other countries we are still only ninth in the whole world in point of telephonic density.

We can easily imagine that in thousands of homes, even while Sir Kingsley was speaking, the question, "Can we afford it?" was revived under more hopeful auspices.

In the electrical world we are rightly talking a great deal about the value of propaganda. In one department the Telephone Development Association has been more or less energetically engaged for several years, while the Electrical Development Association has been at work in another. But we shall not be surprised if rate-reductions and concessions prove to be far more influential than much propaganda, especially when we note the increased activity of the Post Office canvassing and advertising staffs. Possibly the propaganda has created the atmosphere in which announcement of lower charges will make a more effective impression.

It will mean much to the telephone industry—cable-making and laying, exchange equipment and instrument production and so forth, if the number of users is doubled in a short space of time. Is there any substantial reason why it should not be as trade continues to revive? As the Postmaster-General's estimates are borne out in practice, benefit will inevitably come to the industry.

The position is full of significance for all who are anxious for electricity supply to make the great headway that is stated to be possible. Here also the question arises whether propaganda is more powerful than rate-reductions and the provision of better facilities and service. E.D.A. is able to put forth a certain effort to prepare the way, but if rates can be reduced and facilities increased so that electricity is counted among the things that everybody can afford and must have, the increase in the on-coming of new consum rs will be accelerated.

How near are we to the time when the great majority of our homes will be using electricity for general purposes, radio for entertainment and education, and the telephone for keeping us in general touch?

The Flat-rate Alternative

SUPPORT for the view that lighting flat rates should not be as low as uninstructed opinion frequently demands, provided a two-part tariff be available, is forthcoming from the presidential address of Mr. F. P. Tarratt to the Institution of Gas Engineers. In a reference to the Gas Undertakings Bill, 1934, he pointed out that the electrical industry, by keeping its flat rates at high levels, had been able to offer attractive alternatives that provided an incentive to increased consumption at low rates. The gas industry will be unable to take full advantage of powers to introduce multi-part tariffs, as it is under statutory obligation to regulate dividends by the price of gas to its smallest consumers. This has involved the charging of low flat rates, causing the larger consumers to carry an inequitable burden. Nevertheless, there are

electricity supply undertakings which have yielded to mass pressure with regard to their lighting rates, and so cannot offer attractive multi-part tariffs, but the popularity of this policy will wane as more and more people use electricity for purposes other than lighting.

The Progress Continues

WHILE May did not show the same rate of increase in output from public generating stations as the earlier months, an advance of 11.9 per cent. (or 12.4 per cent., allowing for one working day less) over the same month in 1933 is not unsatisfactory, as that month showed 12.2 per cent. in excess of the 1932 figure, although the average rate of progress for the first five months of 1933 was only 6.3 per cent. as compared with 17.3 per cent. this year. The position regarding plant capacity to which we referred on May 18th remains the same.

Past and Future

THE May number of *Electrical Engineering*, the official monthly journal of the American Institute of Electrical Engineers, is a worthy record of the jubilee of that body which was founded on May 13th, 1884. It is thus the junior by thirteen years of our own Institution, which started as the Society of Telegraph Engineers (1871) in the year preceding the issue of the first number of the ELECTRICAL REVIEW. The names of many of the contributors—pioneers in the field—will bring home somewhat dramatically to readers of a younger generation how great is the progress that can be made within relatively few years, and also how reminiscences of the past can be subordinated to thought for the future in men of active intelligence whose zest for electrical development is unabated by age. A chart of important discoveries and inventions is included; this will be useful to those who wish to obtain a correct chronological perspective, but it needs a reference under 1878 to the incandescent lamp of Sir Joseph Wilson Swan to make it complete.

The Nalder Jubilee

FOR fifty years the name Nalder has been prominently associated with the industry in the department which specialises in the design and manufacture of electrical instruments. Congratulations are due to Messrs. Nalder Brothers and Thompson, Ltd., as they celebrate the jubilee of a business which has been continuously devoted to a class of product for which they and other British manufacturers hold a very high reputation throughout the world. The evolutionary processes of electrical engineering industries have involved the exercise of constant originality and ingenuity in instrument design, and have also called for a ready adaptability in production and selling methods to cope with an ever-increasing demand. Reference to some of the stages in the progress of the business founded by the late F. H. Nalder and his brother, and continued to-day under the managing directorship of Mr. A. F. Harris, is made later in this issue.

I.E.E. Council Nominations

THE nominations for vacancies in the I.E.E. Council that will occur on September 30th will once more be received with general approval. Scientific research will be strongly represented by Prof. W. M. Thornton as president, with whom will be Mr. A. H. M. Arnold of the N.P.L., an associate member. The name of one of the new vice-presidents, Mr. W. E. Highfield, is closely associated with transmission problems, as is also that of Mr. J. R. Beard; they are both consulting engineers. The other vice-president, Lt.-Col. A. G. Lee, of the G.P.O., with Mr. N. Ashbridge of the B.B.C., will keep up the end of light-current applications. Mr. F. W. Crawter, who has done such yeoman service on the Selection Committee, will see the other side of the shield as the new treasurer. Manufacturing problems are the special sphere of Mr. V. Watlington of B.E.A.M.A., and large-scale electricity supply of Mr. W. J. H. Wood of the County of London Co., and of Brig.-Gen. R. F. Legge of the British Power & Light Corporation, who, as representing the companion grade, may be said to provide a connecting link with the general public, in the interests of which the Institution received its Royal Charter. So also may Mr. C. L. J. Nadaud, who is a North-Met. sales engineer and is the second associate-member nominee.

Selling Power

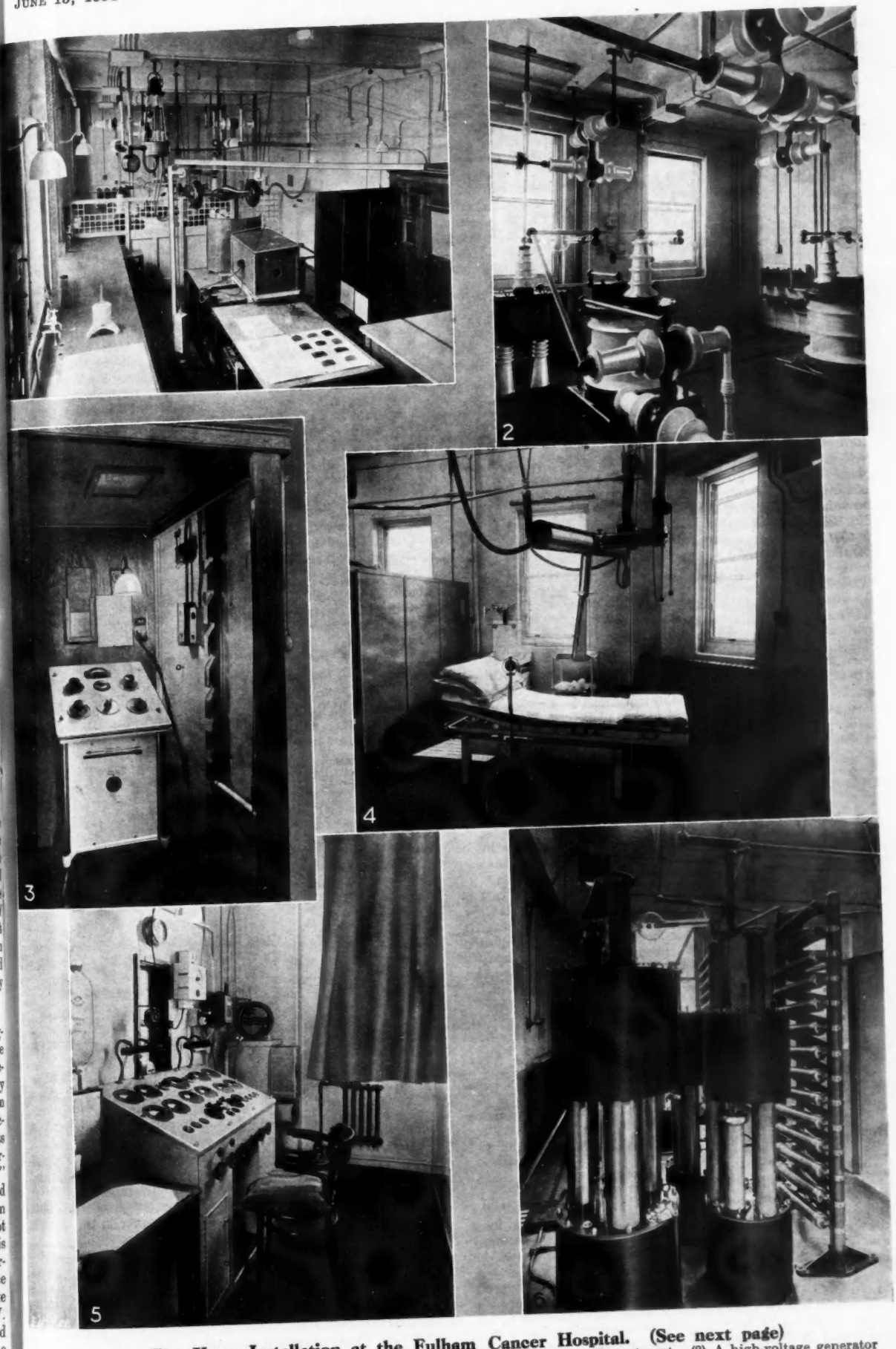
WHILE the valuable I.M.E.A. paper and discussion on measures for the development of the power load are fresh in the memory of our readers we commend to their attention the article by Mr. Ernest W. Short appearing on page 861 of this issue in which it is urged that the Electrical Development Association should become more influential in stimulating the power branch of electricity supply. Though naturally very much occupied with illumination, cooking, water heating and other domestic subjects, the E.D.A., which is now entirely an electricity supply organisation, cannot hardly be charged with indifference to the industrial load, for its members whether municipal or company depend very much upon the power side of their business. But the views expressed by the writer of the article are worthy of close examination by Sir William Ray, Mr. A. C. Cramb, and others who may be able to ensure the provision of a more complete service in power statistics and publicity from E.D.A.

Radio Research

AN advantage resulting from the delayed issue of the Radio Research Board's report for 1932-33, consequent on the remodelling of the system on which its work is carried out, is that it has enabled the Board to record very substantial progress in several investigations which had reached only preliminary stages by the end of 1932. Even at this early stage notable improvements in effective discussion and conduct of work have already been achieved as a direct result of unification. Efforts to ensure more intimate contact between investigator and user have been especially fruitful: with the Post Office in revealing the characteristics of short-wave propagation and with the War Office in solving direction-finding problems. The Board's work has been characterised by the development of a technique which has caused the cathode-ray oscillograph to become a most valuable exploratory tool. In addition to its use in fundamental radio research, several new practical applications have been suggested, and it is noteworthy that many of these applications would have been impossible without the initiative and energy displayed by a British firm of thermionic valve makers in producing a low- and medium-voltage sealed-off oscillograph superior to any of the types produced abroad.

Too Simple!

THE Ministry of Transport has suggested the insertion of a clause in the South Downs Preservation Bill to prevent its limiting the provisions of the Electricity (Supply) Acts, particularly with regard to the erection of overhead lines. Dr. L. Burgin, Parliamentary Secretary to the Board of Trade, has—according to Press reports—had a brain-wave that will reconcile all parties. As an alternative to the erection of "pylons" anywhere he would run all lines inside an elongated steel box by the side of the roadways and control them from a switch box. That is to cut the Gordian knot in the way made familiar to us by conjurors and is just as much of an illusion. In the Government service there are many electrical engineers of eminence who could have put Dr. Burgin right on a point like this, or who could have referred him to the E.A.W. Handbook. It is a pity that one whose words should be regarded by the man-in-the-street as carrying the weight of authority should put wrong ideas into the mind of the public just when a long course of educational propaganda on the more elementary aspects of transmission was beginning to yield results.



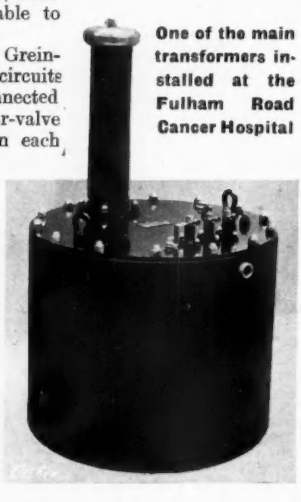
The X-ray Installation at the Fulham Cancer Hospital. (See next page)

(1) A 400-kV constant potential generator in the high-voltage laboratory, Physics Department. (2) A high-voltage generator in the Physics Laboratory. (3) The controls of high-voltage plant in the Physics Laboratory. (4) Treatment room with Ferranti high-voltage plant. (5) The controls of Ferranti high-voltage generator for X-ray therapy. The microphone hanging over the table enables conversation to be carried on with the patients in a separate room. (6) One side of the high-voltage generator of the therapy plant

A 400-kV X-ray Installation

THE equipment of the Radiological Department of the Cancer Hospital, Fulham Rd., London, comprises X-ray apparatus for therapy, diagnosis and physical research. For some years the maximum voltage used for X-ray therapy has been about 200 kV, but for various reasons, such as higher penetration and better biological effects, experiments have been in progress with a view to raising this voltage considerably.

The equipment of the new department consists of apparatus capable of generating 400 kV constant as it was considered wise to proceed to higher voltages by stages. The therapeutic section contains, in addition to standard 230-kV apparatus, a Ferranti h.v. generator, complete with transformers, condensers and control gear, with a guaranteed continuous output at 400 kV of 10 mA (*i.e.*, sufficient for two tubes), but able to handle double the amount.



One of the main transformers installed at the Fulham Road Cancer Hospital

The connections are two Greinacher or voltage-doubler circuits with one pole earthed, connected back to back, giving a four-valve circuit with 200 kV between each valve and earth and 400 kV between lines.

The main h.t. transformers are oil-immersed self-cooled units in plain sheet-steel tanks and are continuously rated, in accordance with B.S.S. No. 326, 1928, and the ratio is 400/120,000 with one end of the h.p. winding connected to the tank. Each transformer is mounted on an insulating transformer having a 1/1 ratio, and with the secondary winding insulated from earth for 120 kV. The potential of the main transformer tanks is fixed by connection to the appropriate point in the condenser bank. This method reduces the insulation in any one transformer, and, therefore, the size and weight of the largest units.

The valve-filament transformers are arranged to give either 12 or 17 V to suit either Philips glass or "Metalix" valves or British valves. They are oil-immersed and are insulated by 1/1 transformers like the main h.t. transformers. The Philips "K.220" glass valves used are suitable for a maximum inverse pressure of 220 kV, and their output is sufficient to supply two X-ray therapy tubes. The connection used gives half-wave rectification as regards current output, but full wave as regards the ripple in the voltage wave.

Ferranti standard rolled-foil paper-dielectric h.v. condensers (such as are installed in all the h.v., d.c. equipments at the hospital) are used with cable-testing equipments up to 400 kV and surge generators up to 1,000 kV. They are mounted on polished bakelite vertical supports, and have a capacity of 0.0035 μF at 400 kV, which is capable of smoothing the h.t. voltage wave to within ± 7 per cent. with 10 mA flowing or within ±3½ per cent. with one tube working.

The control panel is of the desk type for solid floor mounting against a wall; for controlling an equipment of this size, a portable trolley is unsuitable. The main h.v. control is by two small push buttons, mounted on the front of the desk, which operate a double-pole contactor fitted with adjustable overload and low-voltage trip coils.

The voltage is varied by the new moving-coil regulator (mounted separately). A knob with a pointer travelling over a graduated scale can be set to any desired voltage, and the regulator automatically moves towards this position. When warming the tube any period can be allowed for attaining maximum voltage without further attention. A fault in the apparatus, breakdown of the tube, or flashover of the h.t. parts causes the contactor to open automatically in a time inversely proportional to the overload. The contactor is also fitted with a no-volt release so that all doors can be interlocked.

The filaments of the four valves are controlled separately by 30-contact variable resistances. The four voltmeters are calibrated to show the voltage on each valve filament; each valve can therefore be run at its most suitable voltage, thus prolonging its life. The two X-ray filaments are controlled in the same way, except that an additional fine resistance is included so that the filament current, read on a specially calibrated ammeter, can be adjusted to within very fine limits.

The h.p. d.c. volts and h.p. mA are also indicated on the panel. The moving-iron spring-controlled voltmeter gives the h.p. a.c. voltage of the two transformers, which is a rough measure of the h.p., d.c. voltage. Besides this, a special high-resistance potentiometer is connected across the X-ray tube and a panel voltmeter of the electrostatic type connected to tappings on this resistance is calibrated to read h.p. d.c. voltage. The h.p. kilovoltmeter and milliammeter and push buttons are grouped together and everything of importance on the desk is within easy reach of the operator.

All the h.t. apparatus is enclosed behind an earthed metal screen, access to which is obtained by a door interlocked with the main h.p. circuit, which cuts off the supply if it is opened. Automatic discharge switches, operated by the main h.p. supply, are provided for the condensers. In addition, a definite and visible earth can be obtained with earthing sticks.

This apparatus has been used considerably at 320 kV and is now beginning to be used at 350 kV. The tube is a self-protected water-cooled "Metalix" (Phillips) enclosed in a paxolin cylindrical shield, cut so as to allow of access to the tube itself for cleaning. An automatic cut-out shuts off the h.p. should the cooling water fail. A double amplifier microphone loud-speaker system enables two-way conversation to be carried on between the patient and the operator who is in a separate lead protected cubicle.

In addition to the therapy equipment the Physics Department also contains a h.v. X-ray apparatus for experimental purposes. This consists of a Siemens "Stabilivolt-Duplex," which is a deep therapy X-ray unit composed of two modified "Stabilivolt" units, the positive of one being earthed and linked to the negative of the other. The maximum output of the apparatus is 440 kV, and 15 mA, constant potential. It is designed for direct connection to 230 V a.c. 50 cycles. Each unit comprises four components.

(1) A h.p. oil-immersed transformer with a porcelain walled tank and h.p. bushing in the cast-tank top. The primary winding is fed from an auto-transformer in the switch table, and gives a maximum of 100 kV effective, corresponding to 140 kV peak. The primaries of the transformers of the two units, which are in series, are controlled from the desk by a step switch and an inductive regulator.

(2) Two hot-cathode valve tubes designed for an inverse voltage of 230 kV peak, and allowing a h.t. current to pass in one direction only. With a maximum filament emission, approximately 400 mA can be passed, although under normal loads the valves in their charging phase should not have to pass more than 30 to 40 mA, peak.

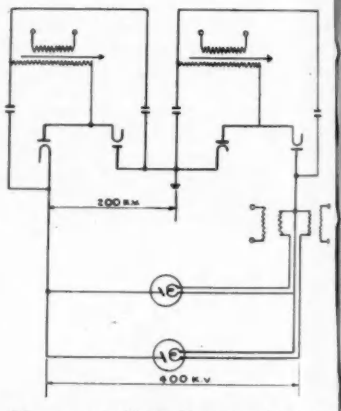


Diagram of 400-kV X-ray equipment

(3) Two h.p. oil-immersed condensers in steel tanks with porcelain bushings. The capacity is so designed that with normal load to the X-ray tube the ripple of the direct voltage obtained from the output terminals is not more than ±3 per cent., although at maximum output this ripple may increase to ±5 per cent. Each condenser is connected in series with a valve tube parallel to the h.t. transformer in the Latour voltage-doubling circuit.

(4) Two valve filament transformers on the h.t. side; these are of the dry open-core type with porcelain insulation, and are connected with an intermediate transformer of similar type in cascade to give a sufficient insulation factor. The primaries are connected to the auto-transformer in the switch table and controlled by a step switch.

A trolley-type control switch desk containing the auto-transformer which lies between the main supply and all parts of the apparatus is common to both units. It also contains the main switch which is combined with the filament switch.

This unit was installed by the General Radiological and Surgical Apparatus Co., Ltd. (British agents for the medical branch of Messrs. Siemens & Halske).

This experimental apparatus has been used chiefly for the setting up and investigation of standard apparatus for the measurement of X-ray and radium doses. The Radiological Department is under the direction of Professor Woodburn Morison and Dr. W. V. Mayneord is in charge of the Physics and Experimental Section.

Power in Industry. By D. J. Bolton

Private plant and public supply

IN spite of the large and spectacular growth of the domestic load, the power load represents the largest element of consumption from public supply mains (in magnitude if not in revenue) and, judging from present rates of growth, it will be a number of years before it is displaced. No very big extension of electricity supply can therefore be looked for unless industry can contribute its share of the growth. Moreover, the power load and the domestic load are not so much competitive as complementary—together they provide diversity, so that each cheapens the price to the other.

The various statistics relating to electricity undertakings are frequently spoken of as though the supply industry represented the whole, or almost the whole, of the country's electricity. Private generation for lighting and domestic purposes is admittedly a minor affair, but private generation for power purposes is by no means negligible. Nor are the types of plant at all what might be imagined by anyone acquainted only with modern technical literature and installation practice. In fact, looking through the Census of Production figures is a little like going through a museum—one sees so many specimens which one had fondly imagined to be extinct!

Three questions stand out as being of particular interest. What total power is (or may be) required in industry?; how much of this power is applied electrically?; and how much of the electricity is taken from public supply mains and how much from private plants? Moreover, each of these questions can usefully be studied on a time basis—*i.e.*, how has the position changed in a given period, and how has this compared with the change in electricity supply in the same period? On the answers to these questions depends, in large measure, the future prospects of some important sections of the industry.

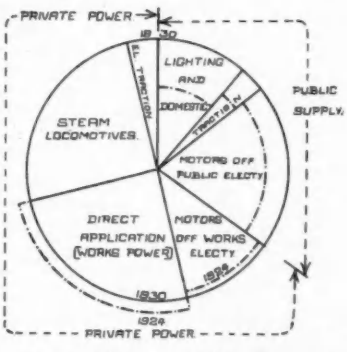


Fig. 1.—How industrial power is apportioned

In the case of public supply there are ample data available in the Commissioners' returns, the last of which (published in November) referred to the year 1931-2. As regards factory power and private generation, the only full information is that contained in the Census of Production which is taken at spasmodic intervals and published after a further lapse of time. The last one was taken in 1930 and preliminary results have been issued throughout the last two years. The final volume for the engineering trades, however, appeared quite recently, and was reviewed in these pages on May 11th.

The latest Census is slightly less inclusive than that of 1924 since it omits establishments employing not fewer than ten persons, and a few minor industries and services, the only one of note from the electrical point of view being that of laundry work. With these few exceptions all manufacturing industries and productive services are covered, including mines, building, railways and public utilities. It is inevitable that with such a mass of figures many of the salient points tend to get lost, and the following is an attempt to rescue some of these, and to illustrate them by graphic means.

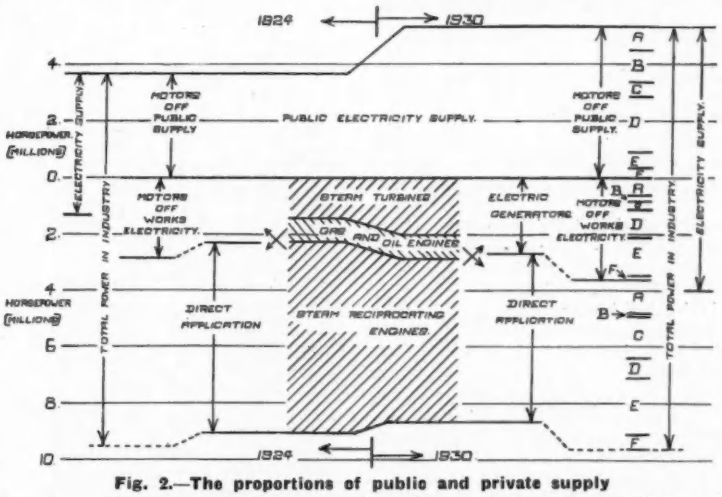


Fig. 2.—The proportions of public and private supply

A. Iron and steel. B. Engineering and shipbuilding. C. Textiles. D. Other factory trades. E. Mines and quarries. F. Other non-factory trades.

How Industry Obtains its Power

The area of the full circle in fig. 1 represents the whole effective or equivalent power applied to industry and transport in the year 1930. This is cut into sectors to show the different divisions, and these sectors have chain-dotted arcs to represent the 1924 figures where available. The first main division is between public electricity supply (upper right-hand side) and private power generation. Public supply is divided into the usual categories of lighting and domestic, traction and power, the division being made on the basis of the units sold for these three purposes. The power developed for private purposes is in two main portions, works and traction. Of the works power, about two-thirds consists of prime movers applied directly to the job whilst the remainder drive electrical generators supplying works motors. In the case of traction the great majority of the power is directly applied, through the medium of steam locomotives, but an appreciable amount is spent in electricity generation for the service of electrified railways and road transport.

The diagram is not quite so simple and unquestionable as it appears. It is, in fact, a somewhat ambitious and perhaps rash attempt to correlate a mass of entirely discordant information. The basis of the figure is area, representing horse-power; and in the case of works power no difficulty arises—the figure taken is the horse-power of prime movers ordinarily in use. In the case of public electricity supply a figure is given in the return for the power ordinarily in use. Presumably this figure is calculated on a basis comparable with the other, and it is therefore employed in the diagram as it stands.

The Transport Industry

In the case of power for electric transport supplied from private stations (top left-hand sector) no figures for prime mover capacity are given on a comparable basis, but the amount generated is listed. The power used for this purpose has therefore been taken from the horse-power in electricity supply, reduced in the ratio which the units generated bear to the electricity supply units.

In the case of steam locomotives, no figures whatever are given for the horse-power, and in any case these would be misleading without some idea of the effective "load factor of the locomotives." But what is more important is to know the *equivalent* power (on an electrical basis) involved in running the traction system, and this the diagram attempts to indicate. The Weir Report on Main Line Electrification gave the coal used on British steam railways as 13¼ million tons in 1929. An equivalent amount for electrical operation may be taken as 40 per cent. of this, and taking the mean efficiency of public supply stations for the same year this is equivalent to an energy consumption of 5,500 million kWh. A similar figure appears to have been assumed in the Weir report itself for the purpose of calculating the cost of energy, so it may be taken as being substantially correct. The horse-power necessary to supply these units is then taken from the horse-power in electricity supply, reduced in the ratio which the estimated railway units bear to the electricity supply units. The result is about six million effective horse-power employed in traction work.

The above points and a number of others are further illustrated in fig. 2, which represents the whole power in the country except that of railway companies, and omitting as before all works employing ten or fewer persons. The portion on the left of the diagram represents 1924 and that on the right 1930, so that the inclined lines in the centre show the change in the six years. There is a horizontal line across the centre of the diagram, and the portions below represent privately produced power and those above represent power from public supply.

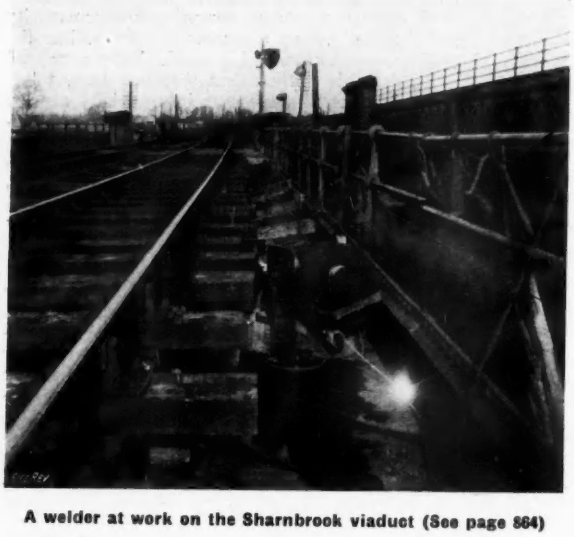
Taking the lower portions first, and starting at the centre, the widths of the shaded belts show the magnitude of works prime movers in millions of horse-power. The divisions cover steam turbines, internal combustion engines, &c., and steam reciprocating engines. The biggest change since 1924 is seen

in the steam turbine group (40 per cent. increase) which has now made a real penetration into the field of works power. No change can be seen in the width of the next belt, since the growth in heavy oil engines almost exactly balances the drop in gas engines and a very small reduction in petrol and water power plants. Expressed in thousands of horse-power the actual changes in the six years have been: turbines+590, gas engines−140, heavy oil engines+150. In spite of these changes the gas engine still represents twice the capacity of either heavy oil or light oil plus water, and the 1930 figures for this belt are made up of—gas engines 54 per cent., heavy oil engines 26 per cent., light oil and water plants 20 per cent.

Passing now to the lowest belt, steam reciprocating engines, the change here (in thousands of h.p.) is −1,000, making a net change in total works prime movers of − 400. Although the change is much what could be expected, the final result is very far from what most people would imagine, owing to the still enormous preponderance of the steam reciprocating set. Even in 1930 it accounted for more than twice as much capacity as all other forms of prime movers put together.

Works Generation

Of the total works prime-mover capacity, about one-third (in 1930) and one-quarter (in 1924) was spent in driving electric generators and the remainder was applied directly to the job. It will be noted from the diagram that the amount corresponded very closely each year to that provided by steam turbines and internal combustion engines. It would be a mistake, however, to equate these two, and to assume that the identical horse-power was so used. Actually about 30 per cent. of the electric generators were driven by reciprocating steam engines, and assuming that the great majority of steam turbines were similarly employed this can only mean that for the most part the internal combustion engines were engaged in direct application. This is indicated by cross arrows on the diagram.



A welder at work on the Sharnbrook viaduct **(See page 864)**

Referring to the utilisation of the electricity generated in works, it will be noted that the horse-power of electric motors exceeded that of the generators serving them in the ratio 1.36 (in 1930) and 1.23 (in 1924). (For convenience, all values in the diagram are scaled in h.p.) This can probably be attributed to the diversity obtained with individually driven machines, and it will be noted that the ratio is tending to increase. In order to allow for this on the diagram the belts have been sloped off as shown by the dotted lines.

Coming now to electric motors supplied by purchased electricity these are shown, to the same scale, above the horizontal zero line. Of the total 60 per cent. were driven by purchased electricity (57 per cent. in 1924), whilst the actual increase in the electric motor drive was about 40 per cent. in the six years. The total electric drive is now 50 per cent. bigger than the power applied directly, whereas in 1924 it was slightly smaller. The results which emerge are that there has been a large increase in the electric drive accompanied by a small change-over from private to public supply. At the same time we are very far indeed from an "all-electric" industry, and it will be very many years at the present rate of change before we achieve it.

As a final overall comparison between public and private power, an ordinate has been drawn representing the total capacity (in h.p.) installed in stations of authorised undertakings for the two years in question. This capacity is, of course, considerably in excess (about 1.8 times) the maximum demand coming on to the stations, but the demand is less than it would be but for extensive diversity: *e.g.*, even within works (where the diversity is much less) the motor capacity is one-third more than the generator capacity. This ordinate will therefore represent, to a fairly comparable scale, the total horse-power or equivalent power served by public supply undertakings. The portion above the horizontal zero (in 1930 this was 58 per cent. of the total) represents actual mechanical horse-power served, and the portion below represents power serving traction and domestic loads. As a confirmation that the scale is a comparable one it may be said that in 1930 the kWh sold for power represented 59 per cent. of the total sold.

In the case of the 1930 figures (right hand end of diagram) the three kinds of power, namely—motors operated off public supply, motors off works electricity, and prime movers directly applied—are each split up into six sections. It will be noted that the iron and steel industries (A) absorb large blocks of power of all three kinds, whereas engineering and shipbuilding (B) take heavy power supplies from public mains and comparatively little from private generation or direct application. Textile industries (C) and mines (E) take relatively little from public mains but have large direct power applications, and, in the case of mines, considerable privately generated electricity. Other factory trades (D) account for the largest consumption from public sources, and this section includes such industries as foods, chemicals, printing, and many of the newer light industries and luxury manufactures.

A Tremendous Scope

The above allocations will give a very fair indication of the present distribution and future possibilities of electric power in industry. The power company, or the motor manufacturer in search of expanding markets, will do well to scan these lettered spaces, and see whether some of them cannot be transferred from the bottom of the diagram to the top. The most striking differentiation in the distribution is to be seen in section (B), and it is certainly significant, to say the least, that engineers themselves (who surely ought to know) find it best to use nothing but electric drives, and to purchase that electricity from public supply mains! (This argument, of course, omits a number of minor considerations, *e.g.*, the use of process steam in some industries as a by-product of the power house.)

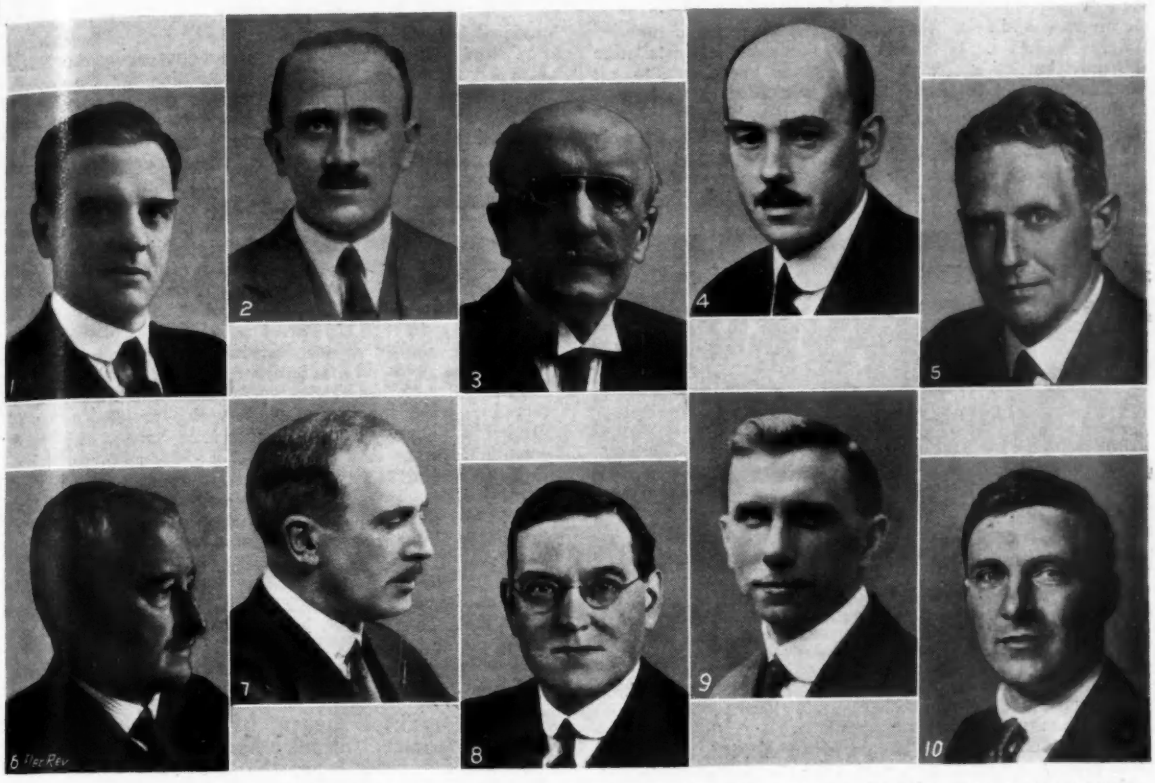
Apart from power considerations there are a number of other tendencies of particular interest to electrical engineers which are revealed in the Census returns. Taking trades in the order of importance, electrical engineering comes seventh in the number of persons employed and fifth in net output, whilst in 1924 its position was ninth and tenth respectively. Electricity supply in the matter of net output came eighth in 1930 and fifteenth in 1924, whilst the gas industry came twelfth in both years. Mechanical engineering ranked first both in number of employés and in output, cotton being second in number of employés but only sixth in output. The horse-power employed per operative naturally shows wide variations. The four highest values were iron and steel (6.2 h.p.), mining products (5.8 h.p.), chemicals (3.8 h.p.), and mines and quarries (3.7 h.p.), whilst engineering, metalwork, textiles and printing each use about 2¼ h.p. per operative. At the other end of the scale come building (0.4), and clothing (0.25). In several cases, *e.g.*, printing, mining products and chemicals, there has been a 50 per cent. increase in the power per operative in the six years since 1924.

Reverting again to the question of power supply, a final conclusion may perhaps be essayed. Public electricity is a later development than private power plant, and may fairly claim to represent an improved and more efficient technique. When one sees that 95 per cent. of the power of the former consists of steam turbines driving electrical generators whilst three-fifths of the latter's power consists of steam reciprocating plant driving directly, the conclusions are obvious both as regards the direction of travel and the distance still to be gone. Those who believe in the superiority of the electric drive in industry, and of public electricity with its super-stations and sets, will have plenty of material in these reports both for warning and for hope. Warning, lest they think the battle is won; hope, because of the plenitude of orders still waiting to be fulfilled before the electrification of industry is complete.

The Young Trophy

The first events in the competition for this trophy, presented by Mr. H. T. Young, will be decided to-morrow (Saturday) at the Boston Manor playing fields. Timed to start at 2.30 p.m., teams will compete at tennis and cricket, the competitors representing the London Graduates' Section of the Institution of Mechanical Engineers and the Association of London Students of Civil Engineering. The winning teams will meet the I.E.E. London Students' Section teams at the same place and time on July 7th. Visitors will be welcomed; there will be no admission fee and tea will be obtainable.

Nominated for the I.E.E. Council



1. Vice-presidents: Mr. W. E. Highfield (Highfield and Roger Smith), and 2. Lt.-Col. A. G. Lee, O.B.E., Engineer-in-Chief of the G.P.O. 3. Hon. Treasurer: Mr. F. W. Crawter, late London Manager, Chloride Electrical Storage Co. 4. Mr. N. Ashbridge, Chief Engineer, B.B.C. 5. Mr. J. R. Beard, M.Sc. (Merz and McLellan). 6. Mr. V. Watlington, M.B.E. (B.E.A.M.A.). 7. Brig.-Gen. R. F. Legge, C.B.E. *(Lafayette)*, (British Power and Light Corporation). 8. Mr. C. L. J. B. Nadaud (North Metropolitan E.P.S. Co.). 9. Mr. W. J. H. Wood, Chief Engineer, County of London E.S. Co. 10. Dr. A. H. M. Arnold (N.P.L.).
(Photographs Nos. 1, 5, 6 and 10 by Elliott and Fry.)

Selling Electric Power.

By Ernest W. Short, A.M.I.E.E.

THE paper on "Developing the Power Load," read by Messrs. H. C. Lamb and W. E. Swale before the I.M.E.A. Convention at Liverpool (and reported in the special issue of the ELECTRICAL REVIEW), will give the greatest satisfaction to all who have at heart the increased application of electric power in industry. The long delay which has occurred since the reconstitution of the E.D.A. without any definite action to deal with the power problem has resulted, unfortunately, not only in a certain loss of time but also in the loss of certain opportunities which will not recur. But the assistance of industrial development has repeatedly and consistently been declared to be in the forefront of E.D.A. policy, and it may therefore be assumed with confidence that the E.D.A. is willing and ready to act.

[Elliott & Fry

Mr. E. W. Short is a member of the staff of the Igranic Electric Co., Ltd.

Now that the nature and the value of the work which can be contributed by the E.D.A. have been defined so ably and so authoritatively, it should be but a step farther to translate promises and proposals into performance. The present time is especially opportune. The prospect of improving business has led manufacturers during recent months to start overhauling existing productive machinery and to order new, as is evidenced by the steadily increasing volume of orders placed for new electrical power equipment of all kinds. The field is large and the opportunity great. If the figures of the Census of 1930 are taken as only a rough guide, they show for the productive industries alone, excluding coal mining, a total of some 3¾ million h.p. still mechanically driven and 2½ million h.p. electrically driven from private generating plants; or, together, something over six million h.p. of potential load for the grid.

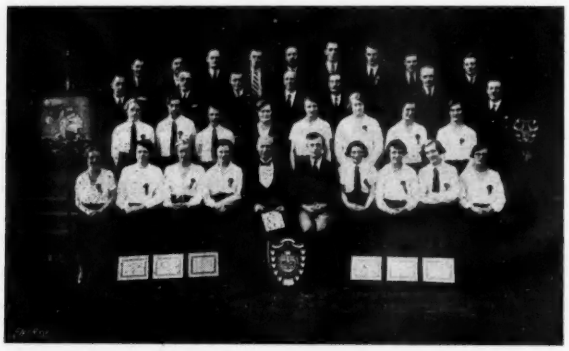
It is essential to bear in mind from the outset, of course, that although the immediate object of supply undertakings is to sell units, the power user has no desire to purchase electricity as such. That is to say, the electrical idea and the notion of novelty, which have a certain appeal in the domestic field, cannot be expected to influence the business sense of the manufacturer. But the manufacturer will buy the service which electric power can render him in his business, with the accompanying and consequential advantages of drawing electric power from the mains, if the certainty is offered to him of an overall gain on annual cost, or on annual production, or in the removal of existing anxieties or manufacturing difficulties. It is an encouraging fact, which is best known to those who are most closely in touch with power problems, that power supply from the a.c. mains can, and does, provide the power user with better service, better production, and greater freedom from anxiety than he can hope to obtain from a mechanically driven plant, or from privately generated electricity. Costs alone may be about equal only if his consumption is of a magnitude comparable with the output of a medium-sized "approved" grid generating station

A Task for E.D.A.

Certain instances where d.c. is essential are properly met by converting on the consumer's premises. But in general, ample evidence is available to support all the claims to superiority of the outside a.c. supply, which the salesman who is possessed of the proper enthusiasm will wish to put forward, always remembering that he is selling service and assisting industry towards more efficient production. And as recommended in the I.M.E.A. paper, it would be a very proper function of the E.D.A. to collect the evidence of this superiority and service and make it, together with the "why" and "how," available to all who are directly concerned in actually developing the power load. The kind of evidence and information that ought to be, and can be, made available is worthy of brief examination, as far as space permits. Its aim should be to assist the supply undertaking; first, in submitting convincing proposals to a prospective consumer, and secondly, in ensuring that the eventual installation and equipment will, in fact, produce the results claimed.

Different branches of industry, producing different kinds and

classes of products, necessarily use different machinery, which has been specially designed and developed for the work, and the generally observable tendency is towards an ever-increasing diversity and away from overlapping similarity of function and requirements. It follows that the electrical installation also must be designed with foresight and knowledge, to suit the machine and to secure that it is worked at its highest productive efficiency. It is always worth while, in carrying out even the simplest conversion or new installation, to apply the best ideas available, with a view to extracting the maximum advantage from resourceful design, so that the result achieved will not only have made another satisfied consumer



The English Electric Choir which scored a remarkable success at the recent Adult Choirs Festival, Stafford, although it had been in existence for only ten weeks. In the centre is Mr. W. E. M. Ayres, M.I.E.E., the conductor

but will become an advertisement of the best possible kind for the encouragement of other potential users. In a broad sense, when negotiating for power load, whether it is the intention or not to offer to supply equipment, it is *never* sufficient merely to present a quotation for the power supply and, without any further consideration, to be satisfied if the consumer just buys a motor to give a certain horse-power at a given speed and a hand-operated starter to comply with the local supply regulations.

Instead, the salesman must visualise the performance which will be most advantageous to the consumer, and in order to do that he must not only be acquainted with the special requirements of the particular machinery and with the economic basis of the operation or process being performed but he must also be prepared to recommend the kind of equipment which will produce the best results that can be gained with certainty and reliability. If he can point to other consumers in the same line of manufacture who have used, perhaps for years, a similar drive and as a direct consequence have been enabled, for instance, to increase both their turnover and their profit, the potential buyer, thus approached on his own ground, is immediately interested and the most difficult step towards completing a sale is already accomplished. The maintenance by the larger supply undertakings of a "consumers list" is thus of enormous value to their own salesmen, especially if a "Remarks" column is used to record tersely any outstanding result of electric driving.

Classified and Available Information

Since much valuable selling information of the kind indicated is apt to be locked up in the records of the supply undertaking in which it originated, it would be an invaluable service to salespeople if the E.D.A. could gather and make available the fullest information about successful installations, industry by industry, so that the smaller supply undertakings, as well as the larger, could be fully informed regarding the best and most successful practice and thereby assisted in rendering equally good service. In every instance it would be especially important to make known the particularly good points about the installation. It may be merely that the printing machine minders throughout a printing works, or the machine tool operators in a large machine shop, can give their mind better to their work if they have full control of starting, stopping, and speed regulation of their machines, by means of a set of push-buttons provided ready to their hand, with the control apparatus fixed on a column well out of the way. Or, again, it may be that a line of multiple-head machine tools, as now frequently installed in works for mass production of motor cars, to drill various diameters, recess, countersink and tap to specified sizes and depths successively, have been so arranged that the individual motors driving the motions automatically start, stop and reverse in sequence and turn and index the table, so that the operator has no more to do than remove the finished parts and maintain the supply of unmachined castings.

The good work that has already been accomplished is the result of the study and technical skill devoted to the problem by the engineers of supply undertakings, by electrical manufacturers of motors and control gear, and not least by the manufacturers of special production machinery for the individual branches of productive industry; all of these would doubtless willingly be laid under contribution by the E.D.A. to assist in the compilation of information for the common good. Such assembled and collated data would also provide all the necessary material for constructive articles to be contributed to the more technical trade journals for each branch of industry and circulating to the chiefs and engineers of power-using concerns, as well as amongst the manufacturers of the specialised machinery commonly used.

The interest of the specialist machine makers in every new and promising development of electric driving which may be applicable to their needs has a good reason. Every improvement assisting to increase production or to reduce its cost and difficulties leads directly to the installation of new machinery, and it is significant not only to note the increasingly large numbers of new machines for diverse trades which are now designed and sold with actually built-in electric drives and control gear, but to observe the definite trend away from d.c. drives and the distinct and specific preference for a.c. driving. The reasons are well known. I have already drawn attention* to the total inability of the d.c. motor to drive a rapidly varying load at a steady speed. The superior characteristics of the a.c. motor for many applications are clear. The simplicity of motor and control gear for all applications, leading to reduction of maintenance, become especially important in a factory using dozens, or hundreds, of motors. These and other reasons have been dealt with elsewhere. The position, however, is satisfactory and encouraging, and no doubt the issue of suitable informative literature by the E.D.A. would go far to assist the salesman in the further transfer of load from private generating plants, which are large, to the a.c. mains.

The Necessary Qualifications

The arrangements thus far contemplated presuppose the existence of a capable power salesman, in touch with the prospective consumer and available to conduct all negotiations. But there are large areas of supply where no power salesmen are at present either available or in prospect, but in which, nevertheless, there is considerable potential power load, sometimes in blocks of quite useful size. If, and when, the E.D.A. undertakes the supply of information to assist in speeding the wheels in industry generally, the needs of such "unprovided" areas should not be ignored.

The local electrical contractor is frequently in the best possible position, because of his local knowledge, to be aware of prospective load which ought to be obtained. Only the lack of specialised technical knowledge for the proper design of the smaller (and more numerous) installations prevents his undertaking the work, and so deprives the electricity supply authority of the benefit of the potential revenue. I am well aware of the limitations under which the contractor may be placed in this respect, and if, sometimes, inadequate and even indifferent work is carried out the reason is perfectly understandable. But the clear remedy is the diffusion of knowledge, heretofore unattainable, and some education in the principles underlying good design, and so leading to good service.

As the deficiency, or defect, in the scheme of things electrical, which leads to the inadequate equipment of installations that do not, in the end, represent good value for money, has proved sufficiently apparent and important to warrant the comment of H.M. Senior Electrical Inspector of Factories†, some counter-action does appear to be desirable to assist in improving the standard of work in which the electrical contractor ought to be encouraged to take a legitimate and larger share. It should not be difficult, and it would not be costly in comparison with the benefit conferred, to set up an advisory service as part of the E.D.A. organisation dealing with power-load development.

Such an advisory and consultative service could be quite unpretentious in size, but by working from headquarters could be available at the request of smaller supply authorities or electrical contractors, or even prospective consumers for whom no other provision is available. Requests from fully organised areas would be referred, of course, to the sales branch of the appropriate supply undertaking concerned, but outside those areas a visit to the site by a technical man, able to advise without bias on the feasibility, layout and equipment of any proposed power installation, and to bring to bear information regarding similar installations elsewhere, would be appreciated as a boon. The mere possibility of securing such assistance would be a direct encouragement to seek out opportunities for doing work of this kind. And in any event the aim and purpose of electrical service would be carried a further well-defined and notable step forward.

* ELECTRICAL REVIEW, November 17th, 1933, p. 691.
† Form 929. "Electrical Accidents, 1932," p. 14.

An Electric Vehicle Demonstration

A THREE-DAY demonstration at Westminster last week of road vehicles propelled by derivatives of British coal was arranged by the Coal Utilisation Council to indicate the variety of home-produced fuels which is now available both for private cars and commercial vehicles. Besides a smokeless steam lorry, those on view used creosote, enriched and compressed coal gas, producer gas, and petrol produced from coal and tar.

The Electric Vehicle Committee of Great Britain arranged for the inclusion of three battery-propelled light delivery vans. The 10/12 cwt. "Gordon" (sole concessionnaire: Mr. P. W. Taylor, 59, New Oxford Street, W.C.1.) is made by the Metropolitan-Vickers Electrical Co., Ltd. It is of the three-wheel type, fitted with ball bearings, the single front wheel being used for steering. The traction-type enclosed motor, made at the company's Sheffield works and provided with exterior cooling fins, drives the front wheel through double reduction gearing, thereby avoiding the need for a differential and reducing loss in transmission to the back axle, the latter being quite plain.

A hinged steering tiller enables the vehicle to be controlled from the driver's cab and also from the kerb side for house-to-house delivery work. A push button on the tiller gives a speed of 3 m.p.h. forward and reverse. With the button held down, depression of a foot pedal releases the tiller control and gives a second speed of 18 m.p.h. There are two braking systems, one applied by a foot pedal and the other by hand levers on either side of the driver's cab. A magnetic blow-out prevents burning of the controller contacts and the lead-acid 60-V battery is of "Ediswan" manufacture. A discharge indicator, electric horn, and lamps are provided.

The 30 cwt. vehicle made by A. E. Morrison & Sons, Ltd. (London distributors: Tomlinson, Ltd., 77, High Street, Marylebone, W.1) has a helical bevel type rear axle with four-star differential and Timken bearings. The motor drives the shaft through a multiple enclosed chain, which also serves as a convenient means of altering the reduction ratio. Sparking of the series-parallel controller is minimised by a magnetically operated solenoid switch in the main motor circuit which prevents current flowing until the change-speed circuits have been closed. A master finger causes the solenoid circuit to break before and make after the main controller.

A "dead man's" pedal provides additional safety to foot and hand brakes, while a control meter on the dashboard automatically switches the 72-V "Britannia" battery off when it has received its correct charge and also indicates to the driver the degree of discharge. Foot control is provided for driving and hand control for manœuvring in garages.

The third electric van exhibited was made by the General Vehicle Co., Ltd., Pakenham Street, King's Cross Road, W.C.1. It is of 20-cwt. capacity and capable of a speed of 18 m.p.h. The single traction type motor will withstand 300 per cent. overload and is of the series-parallel pattern with extra large commutator brush surface and low armature shaft speeds.

The hand-operated controller provides five forward and two reverse speeds, being of the "continuous torque" variety arranged to feed the motor step by step gradually and smoothly. A worm-driven three-quarter floating type rear axle and ball and taper roller bearings are provided, with Bishop cam steering gear and hand and foot brakes. A choice of "Exide," "D.P," or "Tudor" batteries is offered.

Above: The Morrison van. Left: A. "G.V." electric on electrical service. Right: The Met.-Vick. vehicle (Inset: The method of mounting the motor)

A Large Cooking Installation.

By Oscar C. Waygood, M.I.E.E.

THE cooking in connection with the restaurant of Lewis's Royal Polytechnic, Ltd., Glasgow, is done by electricity and steam. The steam apparatus consists of steam ovens, soup boilers, stockpots and water boilers. The roasting, frying, grilling and baking operations are all done by electricity. The photograph reproduced on page 867 indicates the general layout.

The electric boiling table measures 10 ft. long by 5 ft. wide, and has eighteen cast-iron rectangular plates loaded to 3,200 W. Of these ten are divided into sections, each controlled by a three-heat switch, and in addition two 2-kW "Metro-Vick" radiant-type plates are fitted. Each plate is protected by a fuse and pilot lamp. At the end of the boiling table a steam bain marie is fitted, making a total overall length of 12 ft. 6 in.

The roasting is done by two cabinet-type batteries each consisting of four ovens, the loading of two being 9 kW each and the loading of the smaller ovens 5 kW each. Two electric fish ranges have been installed, each having three pans, measuring 20 in. by 20 in. by 9 in., the pans being made of heavy steel plate polished inside and welded with all corners rounded. The elements are clamped to the bottom of the pans and so arranged that the pan is not pierced in any way. Each pan has a loading of 10 kW controlled by switches, with pilot lamps and fuses.

The bakery section is fitted with one small double-deck pastry oven, with a loading of 6 kW per deck, and an 8 ft. by 6 in. double-deck baking oven, manufactured by Baker, Perkins, Ltd., with a loading of 24 kW per deck. Two hotplates, 4 ft. by 2 ft., with a loading of 8 kW each, are included for scone making. Fondants are prepared on a small hotplate loaded to 2.5 kW. Proving is catered for by a double compartment metal prover; each compartment has a 1.5-kW boiling plate.

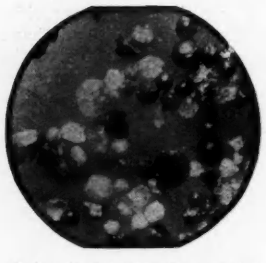
All the equipment described in this article, with the exception of the large baking oven, was manufactured by Archibald Low & Sons, Ltd., to the specification issued by Lewis's Engineering Department. The kitchen was put into operation last September, and each of the sections has been separately metered so that accurate consumption figures are obtainable.

Flue Dust Extraction

The Sturtevant electrostatic precipitator

IN the report of the Committee appointed by the Electricity Commission to consider measures to obviate emissions from power station chimneys (ELECTRICAL REVIEW, December 23rd, 1932), special mention was made of the efficacy of electrostatic precipitation for use with pulverised fuel installations. The field of application with stoker-fired boilers is less, but as the higher gas velocities possible with these reduce the size and cost of the plant an economic case can probably be made out for the adoption of the method here under certain conditions.

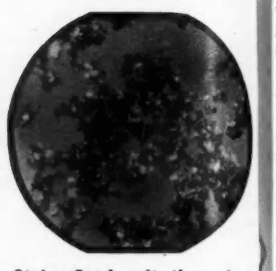
The practicability of the system is due to the development of means of producing d.c. at 40 kV and upwards. The dust passes through parallel earthed tubes down the centres of which negatively charged electrodes are suspended. The ionisation of the zone round a h.v. electrode drives the particles towards the tube in a course which is the resultant of forces due to gas velocity and the electric field. Dust adhering to the tube walls is removed by rappers and falls into hoppers.



Pulverised fuel grit on a 250 mesh screen

Pulverised fuel grit through a 250 mesh screen

Stoker-fired grit on a 250 mesh screen



Stoker-fired grit through a 250 mesh screen

The Commissioners' report refers to mechanical troubles with the older types of rappers used on the Continent, but the Sturtevant Engineering Co., Ltd., tell us that they have not experienced any breakdowns with those of their manufacture. The gas velocity at the tube face is too low to allow the finer particles to be caught by an ascending gas stream.

A large proportion of p.f. dust consists of hollow spheres caused by the formation of gas inside coal particles. The gas forces its way out, usually through one small hole, leaving the solid matter in the form of an inflated football—very light and difficult to trap.

The plant for producing uni-directional current of negative sign used in the Sturtevant precipitator consists of an auto-transformer for regulating in small steps the input voltage of an oil-immersed step-up transformer designed to withstand the high-frequency waves produced by the rectifier. Mechanical rectifiers are usually employed. The equipment includes devices to prevent interference with radio reception. Electrical and mechanical interlocks prevent the entering of a screened area or the precipitator until current has been switched off and the apparatus has been made "dead."

The Sturtevant Co. has found many applications for its system, one of the most important being cement works. We are informed that if desired as much as 99.9 per cent. of the entrained particles can be precipitated, but this is unnecessary for electric power stations. At the Brimsdown station of the Northmet Co. (ELECTRICAL REVIEW, April 13th), the efficiency of extraction called for was 87 per cent. at normal boiler duty and 85 per cent. at peak load, but on the official tests 91 per cent. was obtained. Generally speaking the higher the speed of the gases through the electrodes the lower the efficiency, but the most suitable velocities vary with different gases. Voltage is an important factor in determining the velocity and a higher potential can be used if the gas is a relatively good conductor.

The drop in temperature through precipitator casings is about 50 deg. F. for 500 to 600 deg. working, rising sometimes to 150 deg. for 900 deg. The pressure difference may be as low as $\frac{1}{4}$ in. w.g., an average figure after adding damper resistance being $\frac{1}{2}$ to $\frac{3}{4}$ in. The floor area occupied by precipitators has been found to be slightly less than that required for washers, but the height of the former (including its insulators above and dust hoppers below) is about double. The efficiency in this case was over 90 per cent. for the precipitator and 60 per cent. for the washer; for equal performance an equal height or much greater ground space would have been required by the washer.

The capital cost of a precipitator for a boiler unit of 200,000 lb. per hour capacity capable of dealing with 100,000 cu. ft. of gas per minute at 275 deg. F., including foundations, casings, high-voltage sets, dampers and flues between the induced fans and stack, should not at present prices exceed £4,000.

The accompanying photo-micrographs of grit collected under different conditions, one set on a 250 mesh screen and one through a similar screen, show that the precipitator will collect large particles as well as minute.

An Arc-welded Railway Viaduct

AN important example of the application of electric arc welding to railway bridge reconstruction was the recent strengthening and repair of the Sharnbrook viaduct carrying the two passenger tracks of the London, Midland and Scottish Railway (Midland Division) main line between St. Pancras and the north over the Ouse Valley, a quarter of a mile south of Sharnbrook station. About 140 tons of new steel-work was welded into position.

The welding of the floor and ballast plates was undertaken without encountering any difficulties, but in the welding of the existing cross bracings to the girders slight difficulties arose due to the original oil and paint between the various thicknesses of metal oozing out and getting into the weld, owing to the local heat generated. This was eventually overcome by heating the connections locally by means of blow lamps or oxygen flame, and also by using a caustic soda wash over the part to be joined immediately before the weld was made.

The total amount of welding, mostly double run, approximated to 22,000 lineal feet, and Quasi-Arc electrodes were used. The total number of electrodes required amounted to 66,400, all 18 in. long. The welding plant was also obtained from the Quasi-Arc Co. The two machines were built to the railway company's special requirements and each consisted of a "Dorman" petrol engine, type M.R.A.W. of 33-b.h.p., driving a welding dynamo and auxiliary dynamo at 1,500 r.p.m. The welding dynamo employed is a compound wound d.c. machine capable of delivering a maximum of 308 A for one hour, or 246 A indefinitely, the voltage remaining sensibly constant at the machine terminals at 50 V. By the use of three reactances this dynamo was arranged to supply current to three welders simultaneously, and each welder was supplied with a type L resistance regulator.

The auxiliary dynamo is also a compound wound d.c. machine, which is capable of delivering 23 A continuously at 220 V, and was used to operate electric chipping hammers, an electric descaling and grinding machine, an electric drill, and also provide electric lighting where required. Each large component of the machine is arranged in a cradle, and the machine is designed so that it may be dismantled, moved by hand power, and re-erected in a new position in a very short time. Electric hammers were obtained from the Kango Co., the electric drills from the Vidal Engineering Co., and the electric descaling and grinding machine from Grimston Electric Tools, Ltd.

The work undertaken appears to have been so successful in strengthening the passenger line viaduct that arrangements have been made for the adjoining goods line viaduct of nine spans to be dealt with in a similar manner in the near future.

British Standard Bevel Gears

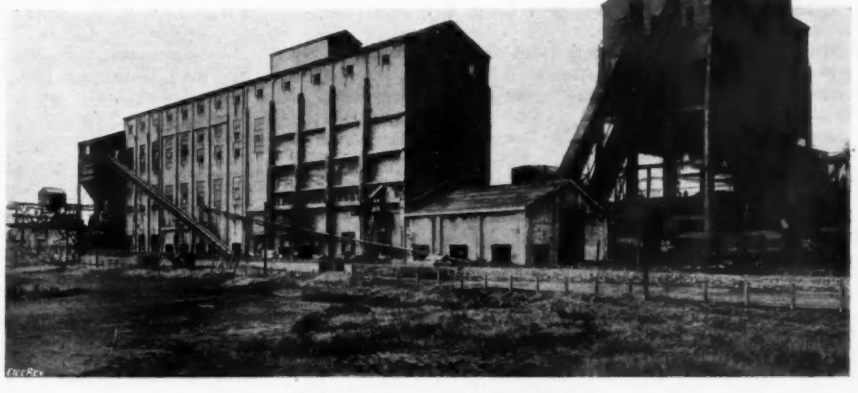
A further step has been made by the British Standards Institution in the standardisation of machine cut gearing with the issue of B.S.S. No. 545-1934 Machine Cut Gears, B. Bevel, for helical, curved, and straight teeth, which deals with the matter in the same comprehensive way as the helical and straight spur Specification issued in 1932. Copies of the Specification can be obtained from the British Standards Institution, 28, Victoria Street, S.W.1, price 5s. net, 5s. 6d. post free.

The Glasshoughton Coking and By-products Plant

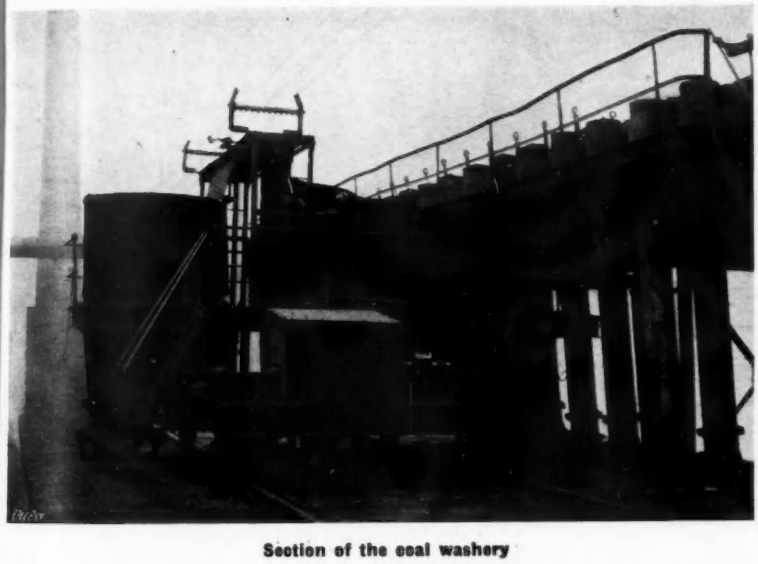
Costs lowered and results improved by modernisation

THE Glasshoughton works of the Yorkshire Coking and Chemical Co., Ltd., have been completely modernised during the last few years, and the result has been increased output, improvement in the quality of the products, and lowered operating costs.

Coal, the raw material of the works, is principally obtained from the adjacent pits of the Glasshoughton and Castleford Collieries, Ltd., from which also electricity is obtained at 3,000 V, 50 cycles, 3-phase. It is stepped down on site to 440 V, 3 phase, for power, and 240 V for lighting, and as a measure of safety 600-W transformers are installed for supplying 40-V inspection lamps. As armoured cable was difficult to obtain during the war, distribution in the original coke works is by overhead conductors, but all additions have v.i.r., d.w.a. cables. The original medium-voltage distribution is taken from B.T.-H. circuit-breakers, extensions being controlled by Ellison unit-type distribution switchgear. These



Coal washery and coke bunkers



Section of the coal washery

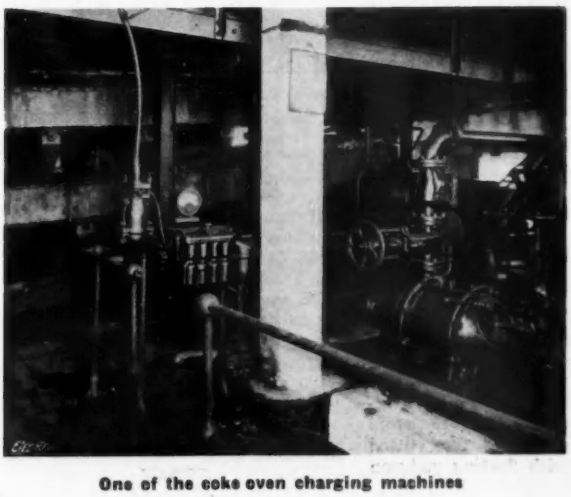
feeder control units consist of oil-break circuit-breakers mounted on a busbar chamber and provided with isolating switches, ammeters and cable trifurcating fittings for the 3-core cable. Watt-hour meters are fitted to each panel to help keep accurate records of each section of the plant. Motors for the various drives on the plant range in size from 1 to 155 h.p., all, with the exception of those in the screening house, being controlled by Ellison standard oil-break starters or circuit-breakers.

Coal is delivered to the works in wagons, unloaded by a mechanical tippler into an elevator pit, and raised by elevators to a washery with a capacity of 120 tons per hour. The coal washers are a series of troughs tilted at an angle so that water flows along them readily and takes the coal along with it. Any shale that is present sinks to the bottom and is retained by weirs, the coal flowing over. The circulating water for the washery is supplied by a 100-h.p. pump. The shale and dirt are taken to hoppers and finally to the refuse tip by a 32-h.p. aerial ropeway. After being washed, the coal is passed to drainage bunkers. Distributing tables arranged beneath the bunkers feed the coal on to an endless belt which takes it to two Carr disintegrators driven by 85- and 155 h.p. motors, respectively. Two bucket elevators, one 70 h.p. and one 85 h.p., raise the crushed coal to service bunkers from which it is fed into the coke oven charging machines which travel along the top of the coke ovens. The charging machines are driven by 20-h.p., 720-r.p.m., G.E.C. motors with tramway-type controllers, and each machine holds sufficient coal for one oven. The ovens are gas-fired on alternate sides, each side burning for about 30 minutes.

The reversal of combustion is effected by reversing the gas valves and dampers, and these are operated by winches driven by a 3-h.p. squirrel-cage reversing motor controlled by an Ellison circuit-breaker and Igranic self-acting reversing panels, carrying master time switches. The gases evolved from the coal pass from the ovens into a gas main, and on to the by-products plant. About 50 per cent. of the gas produced from the ovens is used for oven heating. A gas booster, driven by a 15-h.p. G.E.C. squirrel-cage motor and controlled by an auto-transformer starter, passes a portion of the gas back to the Glasshoughton and Castleford Collieries for steam raising in gas-fired boilers. From the ovens the coke is pushed into a coke car and hauled by an electric locomotive to the quenching station. The electric locomotive, constructed by Messrs. R. & W. Hawthorne, Leslie and Co., Ltd., is driven by 60-h.p. Mather & Platt motor operated by a tramway-type controller with an Ellison main oil-break circuit-breaker. The brakes and gates on the coke car are operated by compressed air, and a 10-h.p. M. & P. motor, controlled by a hand-operated star-delta starter, drives the compressor.

Power for the locomotive is taken from trolley wires mounted along the ovens, and an Ellison 200-A oil circuit-breaker which controls the supply is mounted in the open entirely unprotected from the weather, as is the similar breaker on the coke-oven charging machines. These breakers are standard in every way and no special precautions are taken to make them weatherproof, but because of the destructive fumes in the atmosphere they are given a coat of paint once a year.

The pumps in the coke-quenching station have 10-h.p. and 15-h.p. motors controlled by star-delta starters, and in at least one case an Ellison 3-way cable end coupling is used to tap off the supply to the starter. The cooled coke is deposited on the wharf and taken by a belt conveyor to the screen-



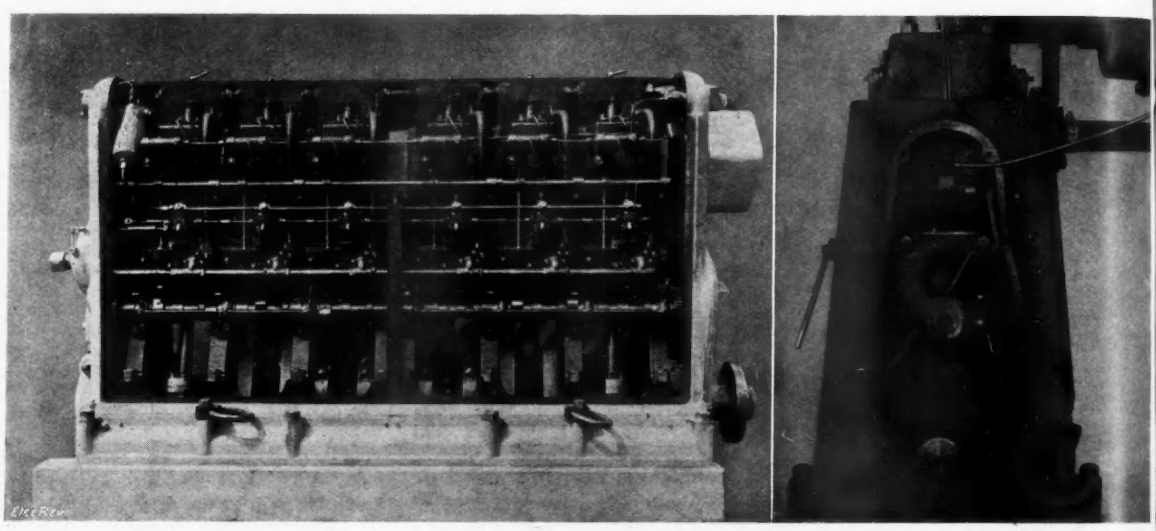
One of the coke oven charging machines

ing plant. This conveyor is about 100 yards long and is driven by a 25-h.p. motor. The various motors in the screening plant range in size from one to 15 h.p. and have Igranic automatic starters, so arranged that the motors start up in sequence with a definite time lag between each, thus preventing fresh coke being delivered on to any screen before it reaches its working speed.

The wharf belt conveyor delivers the coke to a grizzly screen spaced to remove breeze below 1¾ in., the larger coke being passed on for loading or for breaking down to smaller sizes. Elevators and conveyors connected with the screens of various sizes feed the coke into appropriate hoppers or on to a boom loading conveyor and so into wagons. By-products are recovered from the gases given off from the coke ovens. These gases are exhausted by a 190-h.p. turbo exhauster capable of handling 15,000,000 cu. ft. of gas per day. The gases are cooled by counter-current water coolers which remove ammonia liquor and tar. The cooler pumps are driven by 45-h.p. M. & P. squirrel-cage motors with Ellison auto-transformer starters. The two final cooler pumps are each driven by 15-h.p. G.E.C. motors. All by-product process pumps are situated in the exhauster house and are driven from a line shaft by a 65-h.p. motor. Sulphate of ammonia, benzol, creosote, tar and ammonia are recovered.

New Heavy-oil Engines

DURING the past few days we have had an opportunity of inspecting two new ranges of vertical totally enclosed cold-starting heavy-oil engines built by Messrs. Blackstone & Co., Ltd. One range is designed for outputs of from 75 to 225 b.h.p. (37½ h.p. per cylinder). The normal speed is from 450 to 600 r.p.m., with piston speeds of from 860 to 1,150 ft. per min. Compression pressure is 430 lb. per sq. in. and the maximum cylinder pressure 650 lb. per sq. in. Fuel consumption at its best point (¾ load) is 0.389 lb. per b.h.p. hour and at full load 0.397 lb.; lubricating oil works out at 0.112 oz. per b.h.p. hour.

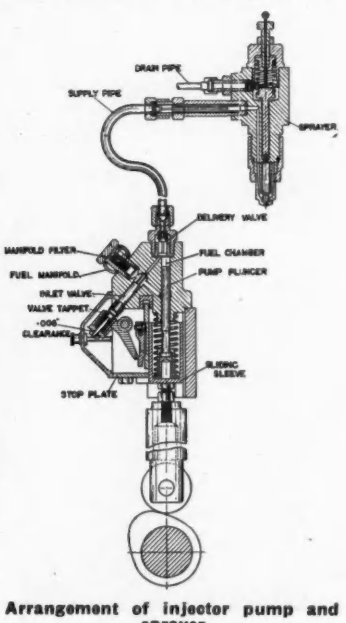


Left: A 225-b.h.p. six-cylinder Blackstone " E.P.V." engine. Right: A 3-h.p. " Fuelol " engine with inspection door removed

The frame is a ribbed monobloc casting carrying the cylinder liners and including a cooling water manifold. The engine bed is a single casting incorporating the housings for the main crankshaft bearings as a unit and with a well at one end for the lubricating oil. There is a separate heat-resisting c.i. box-type head for each cylinder. Air and exhaust valves of heat-resisting steel are placed horizontally and can be taken out without removing the piston, cylinder head or sprayer. The turbulence plate of special alloy is a separate part and is designed to protect the cylinder head from extreme temperatures.

An air-starting valve and an indicator fitting are embodied in each cylinder head. The detachable liners are of nickel-chrome cast iron. The aluminium-alloy pistons are of a self-compensating type to avoid slap and are fitted with floating gudgeon pins with capped ends, above which are a fire ring, two duplex pressure rings, and an oil scraper, and below an oil control ring. The flywheel end of the solid-forged crankshaft (made from 40-ton steel) is flanged to take a half-coupling for a dynamo drive.

The most interesting point about this engine is, perhaps, the C.C.C. pump injection system by which the fuel is fed into the cylinder, where it is ignited by the high temperature of the cylinder air under pressure. The compression ratio is fourteen to one. The pump for each cylinder is carried on the detachable tappet block mounted directly over the camshaft and is connected to a sprayer fixed to the top of the cylinder.



Arrangement of injector pump and sprayer

The plunger stroke is constant, the amount of fuel delivered being varied according to the load by the governer, and the surplus returned to the pump suction. A constant flow of fuel oil to each injector pump is maintained by a main gear-driven pump, which can be hand operated for flushing before starting the engine. The four-weight horizontal governor can be adjusted to give a speed range of ± 10 per cent. A geared pump draws the lubricant from the engine sump through a duplicate filter (one section of which may be removed while the engine is running) and forces it through a cooler to all parts of the engine except the tachometer.

We tested the claim for simple starting by running up a four-cylinder set. In a few seconds it was running on full load. It is just a matter of turning a single hand-wheel which admits compressed air, controls the fuel supply, moves the camshaft from half to full compression, and finally shuts off the starting air.

Accessibility of all parts is a notable feature of this engine. The removal of light aluminium covers enables the components to be inspected during operation. The camshaft, for instance, which is carried on the side of the engine, is fully exposed when the covers are removed, and can be removed without disconnecting its duplex roller-chain drive. We were informed that a piston could be withdrawn in ten minutes.

The new single-cylinder engines of the " Fuelol " type are made in three sizes, 3, 5 and 7½ b.h.p. for speeds of 700, 650 and 600 r.p.m. respectively. The c.i. frame carries the crankshaft bearings, liner and combustion chamber and encloses all the working parts, making a really neat looking job. The design of the door makes inspection easy. Forced lubrication is maintained by a plunger pump. The governing system is similar to that of the larger engines, these being the first, other than high-speed machines, to which the system has been applied.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Radio Apparatus and Change-overs

Referring to the article by Mr. R. H. Cobbold in your issue of June 8th on the responsibility of companies and corporations for the conversion of consumers' radio apparatus, practically every type of radio apparatus can be converted, and this is much less expensive than supplying a new set.

A rectifier without smoothing could be used, but this method is undoubtedly undesirable, as the resultant hum in the receiver would never satisfy the consumer. A completely smoothed rectifier unit may give satisfactory results, but in case of breakdown or wear of valve, necessitating its renewal, the consumer might consider this part of the supply undertaking's responsibility, or he might object to another unit to look after and supply with current. For high-tension supply units this is very often the best or only practicable method, as consumers are already accustomed to the separate leads and voltage-tappings and would not care to have the d.c. unit altered in any way.

With regard to complete receivers and radio-gramophones, internal alterations provide the most satisfactory method of solving the problem. This is done in nearly every case by the fitting of a mains transformer, and either a metal rectifier or rectifying valve of sufficient size to supply high-tension current. The valve filaments (or heaters) would be arranged in parallel, and supplied with current from a winding on the mains transformer. Where a d.c. receiver employs directly heated valves, these would be replaced by valves of the indirectly heated type, except probably in the output stage. In d.c. sets using indirectly heated valves these are retained and a suitable winding put on the mains transformer to give the necessary filament voltage, which may range from 4 to 35 V.

Energised speakers incorporated in receivers can have their field coils rewound to the correct resistance for use as a choke in the high-tension supply circuit, thus saving the cost of a larger choke. Receivers using permanent-magnet or moving-iron speakers usually need to be fitted with a choke of higher inductance than is necessary on d.c. It will be found that very many of the d.c. radio-gramophones are fitted with universal motors.

The method which we have outlined has been found to be most satisfactory and reliable. As many receivers employ the same chassis and lay-out for both d.c. and a.c. designs, it is often possible to convert a set without any structural alterations. We shall be very pleased to place our experience freely at the disposal of any change-over engineer who cares to write to us.

RADIOMENDERS.
Thornton Heath, *June 9th*. H. H. Pacey.

An Improvement Needed

Why are some electricity supply department showrooms so poor in style, lighting and general layout? Surely as distributors of a modern product they should be very modern in these respects. The use of neon for publicity purposes is rapidly gaining ground, and while a number of supply departments have adopted it, it is not used half as much as it might be.

In many cases the window displays appear to have been designed by someone who has no idea of the job. Window display, like other branches of publicity, is an art, and the showroom window should be dressed by someone who is well conversant with window display, if it is to do its duty and be attractive.

We have serious rivals in the gas industry, who are putting up a strong fight, and who, with the co-operation of the manufacturers of gas appliances, are not hesitating to get the best results from their windows. Is it that the electricity undertakings do not get such good support from appliance manufacturers, or is it that they are content to " sit and wait "?

If they are to make the consumption of electricity universal, they must take publicity seriously, as a valuable ally, and stifle the false impression that electricity is an expensive luxury. Let them set an example to industry in conforming with the new mental outlook of the Electrical Age. D. MILLS.

Birmingham, *June 9th*.

Electricity on Tap

The running charge of two-part tariffs is growing smaller and smaller and will eventually disappear as time goes on, leaving only the fixed charge. After all, why should not electricity be charged for as water is—having an annual or quarterly fixed price, and allowing a householder to take as much current as he likes?

This fixed price should be proportional to the maximum possible demand of the household and a yearly census of apparatus connected should be taken and the fixed charge adjusted to suit. HUGH L. TAYLOR.

June 10th.

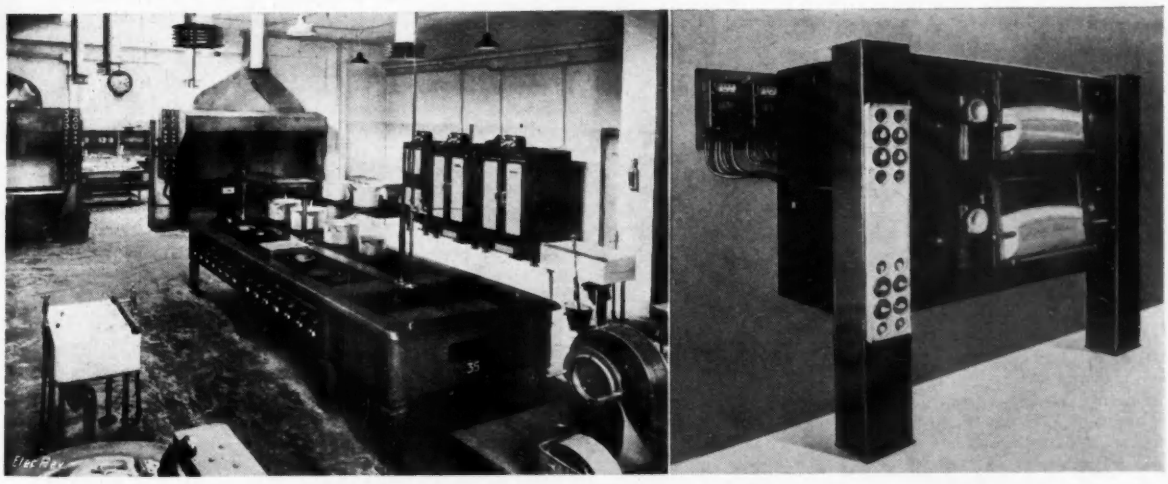
A National Electrical Exhibition Proposed

There is a growing need for an annual show of electrical products in a large and imposing array that will arouse Press and public interest. This great industry with its appeal to millions of people has not yet inaugurated an annual show where the public can follow the trend of progress and design. The Motor Show at Olympia has become an event of importance to the whole public of Britain through the publicity which it receives in the daily Press. There is a wonderful inducement to the layman to visit the show and see the exhibits, and the desire to possess a car is sown in the minds of those who are so interested. The Radio Show is another instance of how the public have to absorb radio news with their breakfast for the period of the show. The building trade, which has a more limited field of appeal, has its annual exhibition where architects and builders meet to study the new trend of designs.

The great electrical industry, which is the most flourishing in the world, has no great annual exhibition to focus the minds of the people on the changes that progress brings in designs. The propaganda value which a national show would have for the electrical industry would be of financial benefit to all concerned.

The I.M.E.A. holds a small exhibition where certain firms display their wares. The various supply companies and corporations hold electrical exhibitions in different areas, but these all lack the great unified effect of a national electrical exhibition.

September would be an opportune time for such a show. The Building Exhibition is held in London at that time and large numbers of architects and builders are in town. The



The general layout of the Glasgow restaurant described on page 863, and (right) the double-deck baking oven

beginning of the lighting season is also a good time to show what the manufacturers have to sell for the coming season. The public would be made aware that better and newer equipment was being offered to replace the older types.

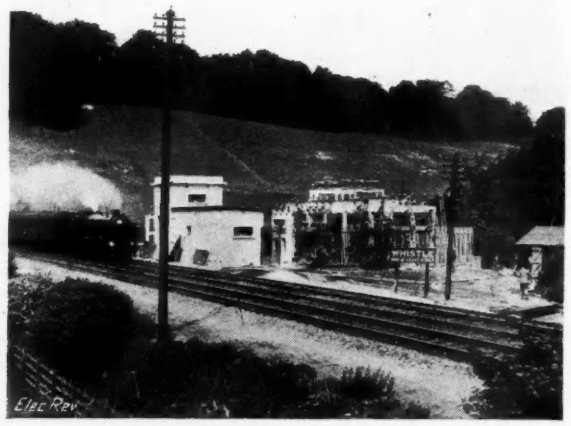
The need for this should be evident to all, and I feel it is time that the manufacturers of electrical products collaborated in a great national electrical exhibition. M. C. TONER.

London, S.E.19, *June 6th.*

Dangerous Wiring Methods

With reference to the recent article by Mr. A. H. Dykes and the letter from "J. O. D." in your current issue, and in view of the fatal accidents that keep occurring on jobs carried out by people who do not understand the elementary principles of a "safety first" electrical installation, I am more convinced than ever that it ought to be a punishable offence for anyone who is not fully qualified to carry out any extensions or alterations or new work on a 230-V a.c. supply.

The rules that have been drawn up for the public safety in connection with electrical installations are all right if the work is carried out by competent engineers, and I should like



Work is proceeding rapidly on the electrification of the Orpington-Sevenoaks section of the Southern Railway. Our picture shows the sub-station at Pol Hill tunnel in course of erection

to see a law passed and put into operation forbidding anyone except registered contractors or members of the Electrical Contractors' Association carrying out any work on the public supplies of this country.

This would curb the jerry builders, who accept the lowest price, irrespective of quality and workmanship; would be the means of lifting the contracting industry on to a higher plane; and at the same time would go a long way towards preventing fatal accidents and fires.

Compulsory registration is what is required, and appears to be the most satisfactory solution to the problem.

Bradford, *June 11th.* HARRY MOSS, A.M.I.E.E.

With reference to recent correspondence concerning the need for more electrical inspection in certain districts, I wish to mention the following incident which occurred some time ago.

During the construction of a large public building two men, not engaged on electrical work, after wasting over an hour, requested us to locate an intermittent disconnection in a cable approximately 40 ft. in length supplying 230 V a.c. to a portable drill. The cable, consisting of nine sections, owing to previous leaks, was roughly jointed and badly taped and allowed to rest on a wet surface. W. PENSTONE.

Leyton, *June 9th.*

In Ireland Now

The operation of their Electricity Acts by both Governments in Ireland has brought disaster to many; not only to the elderly men in the profession, but also to the men in the trade. The full meaning of this has not yet been brought home to the latter, but they will see it clearly in the near future.

The Acts have made a Government monopoly of the generation, transmission and distribution of electrical energy. This monopoly is in the hands of the Civil Service and Boards, and the elderly professional men who had hitherto practised as consultants for statutory and non-statutory undertakings and for private works are, of course, beyond the age limit for Civil Service appointment, and have been brutally "outed."

In Ireland now the capital is the public funds, the staff is the Civil Service, and the super-salesmen are the Board. This happy combination is out to kill competition. It is doubtful whether the trade can sell anything at all, even their labour. While, strictly speaking, the sale of, say, a lampshade may or may not come within "the meaning of the Act," the fact that no one but the Government will sell it is the cold truth.

That, perhaps, explains why we have so many queer fellows going about calling themselves electrical engineers or electricians. They are auctioneers, drapers, chemists, insurance agents, and use the trade as a side line, and a boost, to their own business. The mass is leavened by a sprinkling of the real article. It looks better that way.

In assisted wiring and free wiring for hired motors and hired heating apparatus we have severe simplicity. No one but the appointed can do this work. This, of course, puts them in an effective position to do all other work. The public do not want to have two sets of contractors in their homes and business places at, almost necessarily, the same time.

Is this sort of thing to be allowed to go on? Many years ago I did my best in this journal to put an end to the abuses of my day. In the main I succeeded in securing that qualifications from a competent authority should be required for all in public service—and especially for those engaged in municipal central station work. It's a far cry to the days when highly trained men were obliged to disguise themselves as switchboard attendants while the sons—young lads—of mayors and aldermen strutted the boards as engineers-in-charge.

If we do not act now what of the future? Can a trade and profession which does not attract to itself the best brains possibly continue to exist? P. T. WHITE.

Rostrevor, Co. Down, *June 5th.*

Institution Membership

I heartily endorse Mr. Penstone's views on this question especially with regard to the members who years ago were able to enter the Institution by arranging with their friends to sign the necessary application forms. Fortunately, and for the general benefit of the industry, the method of entry has been considerably tightened up since the Institution was granted a charter.

There is a considerable number of members who are salesmen by profession; these possess little, if any, real electrical engineering knowledge other than that required to sell the products of the firms who employ them. I even know from bitter experience of a member who entered the Institution many years ago, and who, when acting as consultant for the electric lighting of a town, forgot to include a neutral busbar on the l.v. switchboard controlling the three-phase, four-wire distribution to the town, and furthermore specified balanced-load kWh meters. This, unfortunately, was for a foreign municipality which in future will have little or no time for gentlemen sporting "M.I.E.E." after their names.

Until such times as those of the older members who are by no means modern electrical engineers disappear from the roll of the Institution, the professional value of membership will remain at a discount in the eyes of the public. It is therefore very necessary that all corporate members should be persons of undoubted training and experience holding responsible positions in order to maintain the status of what ought to be recognised as a highly technical profession.

Harrow, *June 8th.* A.M.I.E.E.

Mr. Smith's letter in your issue of June 8th shows that he has had experiences similar to my own. He expresses a feeling of dissatisfaction that, like myself, after making a considerable outlay for training at a technical college or by correspondence courses, a complete setback is encountered when one wishes to put the accumulated knowledge of years into operation. As the future of the whole industry lies with the rising generation, is it not only fair that they should be given an opportunity of showing their genius, now lying hidden and, perhaps, never to be exploited solely due to the present unfortunate state of affairs?

I agree with Mr. W. Penstone that appointments are often filled before being advertised, although the fact is not stated, but it does not clear the point that preference is generally given to one who has a recognised suffix to his name. There is, without question, a large number of those who obtain positions by sole reason of personal backing, which makes it harder for a conscientious man to obtain a similar position, as his abilities may not be brought before those responsible for the appointment of the candidates.

Further comments on this subject from readers will be most welcome, either personally or through the medium of your excellent paper. R. W. RAPSON.

Blandford, Dorset, *June 9th.*

Laundry-iron Flexibles

Some time ago you were good enough to publish some notes of mine on our experiences with electric irons in the dyeing and cleaning industry, in which I mentioned that the longest service we were able to obtain from the flexible cords before breakage occurred was six to eight weeks. Since then, I have

tested out many more types of cord under identical conditions of use, and the results show a surprising uniformity. Cords by leading makers all gave about the amount of service mentioned and then burnt out, always at the iron connector end. Some cheaper makes lasted hardly a fortnight.

In two cases only did we obtain longer service than eight weeks; one, a cord made of copper strands woven round a cord centre, after the style of telephone cords, lasted for approximately ten weeks. The other, consisting of three stranded copper cores with reinforcement of steel strands, insulated with varnished cambric and asbestos, braided with jute, is still in use (three months' service). It is, of course, rather stiffer, and from the selling point of view is not an attractive cord. The operator, however, finds it quite easy to work with.

One other cord, of the normal three-core type, copper strands and rubber insulation, has been fitted with a modified connector; the usual coiled spring neck has been replaced by a much stiffer coil, with an arrangement for clamping the cord tightly, where it enters the coil. This arrangement takes the strain off the extreme end of the cord, where the breaks have always occurred before. The cord used in this way is of good quality, but quite light, and usually broke down after about six or seven weeks of ordinary use. It has now been in use in the above way for eight weeks, and shows no signs of strain and I expect it to last many more weeks.

Thus you will see that we have found a high degree of uniformity in the performance of the leading makes of flexibles; the next step appears to lie with the makers of connectors, some device for removing the direct strain from the extreme end of the cord being indicated. I may mention that our ordinary connector is one of the best makes on the market at the present time.

I understand that experimental work on the same lines by the British Launderers' Research Association also indicates the same need. This Association has found evidence of the necessity of keeping the end of the cord still further away from the body of the heated iron. It is probable that the longer life of the steel-cored flexible is due in some part to its rubberless, and more or less heat-proof insulation.

London, *June 4th*. A. GREENWOOD,
Norwood & Dulwich Dyeing, Cleaning & Carpet Beating Co., Ltd.

What is Ohm's Law?

I would like to comment on some points raised in the correspondence in connection with the apparent exceptions to the operation of Ohm's law. In the first place, it is not necessarily an outstanding discovery to find that certain types of conductors fail experimentally to obey Ohm's law when it is known that the inherent characteristics of the conductor are subject to modifications by the effect of a change in current. When these phenomena exist they do not disprove Ohm's law.

I would in particular point out that Mr. Sayers's letter of May 19th definitely contradicts his contribution on the subject dated May 14th. He feels very keenly on the subject of "loose terms" but I cannot help feeling that he himself is a gross offender. For example, because a neon tube apparently does not obey Ohm's law he immediately invests it with the "property of impedance." How can this be so when only by the greatest stretch of imagination can an average neon tube, relatively speaking, be said to possess inductance, whilst its capacity is also very insignificant compared with its resistance. In any case such self capacity could have no influence in the case of a neon tube running on a d.c. supply. If, in this theory, a resistance must be called an impedance when it apparently does not obey Ohm's law, then it follows that an electric lamp is an impedance also, which would hardly be accepted in the particular sense.

I must only conclude, therefore, that Mr. Sayers when speaking of impedance of a neon tube, really meant impedance of the neon-tube circuit with its associated transformer, etc.

Preston, *June 5th*. A. SEDWELL.

Replying to Mr. Sayers's letter in your issue of June 8th, I may say that during the last forty years I have been trying to teach many hundreds of students what I call the A.B.C. of electricity—the application of Ohm's law—as Mr. Sayers understands that expression.

Let me take his own "illustration" to emphasise the ideas which I put forward in your columns on May 18th. A battery is supplying a steady current I amps through a resistance r ohms. This battery is assumed to have an e.m.f. E (constant) and a resistance r ohms. Taking Ohm's law in the sense familiar to Mr. Sayers, he is able to state that $I=E/R+r$ and also that $(E-V)=v=Ir$ where r is a measure of the property of the conductors *inside* the battery, known as resistance. But how is the value of r to be determined?

Mr. Sayers says it can be determined by taking two different values of the current I. This is only true if the materials of the battery behave as simple conductors; that is, the r remains constant when I is changed. But this is not the case. If Mr. Sayers will measure the resistance of a battery carefully by an accurate method, he will find that as in some other cases the ratio v to I is *not* a constant. Since the original meaning of Ohm's law was precisely that the ratio v to I (other physical conditions remaining constant) is a constant, some of us express the above fact by saying that the conductor "does not obey Ohm's law."

One other point. Mr. Sayers says that the pronouncement of my old and much respected teacher (S.P.T.) "ought to settle the matter." Surely this correspondence alone proves that it did not do so. So long as the expression "Ohm's law" is used to denote two different though related conceptions, and so long as electrical people use the expression without being fully aware of this fact, no "pronouncement" by any authority, however much respected, will "settle the matter."

Eltham, *June 11th* R. A. WEST

Arc-extinction in Oilless Switches

AS an outcome of investigations in the testing station of the Voigt and Haeffner A.G., water and compressed-air circuit-breakers have been developed with distinctive arrangements of the steam and air blasts for quenching the arc between the contacts. These switches, which contain no oil, are shown in the accompanying diagrams from *Elektrotechnische Zeitschrift*. In the case of the water switch, shown in its closed position in fig. 1, the moving contact *c* leaves the fixed contact *b* and travels upwards when the switch opens. The arc is thus drawn into the chamber *a* and the steam there generated drives a mixture of steam and water out of the bottle-neck opening at the bottom of the chamber, thus constricting and cooling the arc and cutting it off from the moving contact of the breaker.

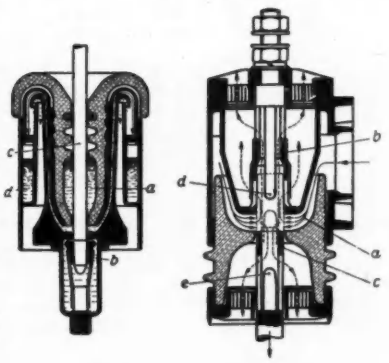


Fig. 1 Fig. 2
Water and compressed-air circuit-breakers

Generation of steam does not commence in *a* until the tip of the moving contact has been drawn into the chamber. The bottom opening is then clear, preventing any dangerous rise in pressure, and the emerging blast is in the opposite direction to the movement of the contact *c*. The limitation of mechanical pressure in the switch chamber permits ceramic material to be used between the live parts. A switch of this type, tested at 9 kV, 50 cycles, interrupted 9,600 A in 1½ cycles, corresponding to a breaking capacity of 225,000 kVA in a three-pole assembly for a 15-kV, 3-phase system.

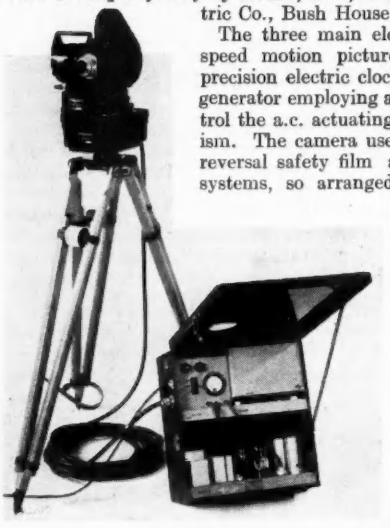
In the compressed air switch (fig. 2), the essential feature is the lateral injection of air which then flows equally upwards and downwards, clearing the arc space of metal vapour, removing electrical charges from the quenching space, and cooling both electrodes. Also, after the arc has been extinguished, the air flow carries ions outwards away from the incandescent electrodes, instead of from one electrode to the other, as where a unidirectional blast is employed.

The tendency to re-ignition of the arc is thus avoided. As shown by fig. 2, the fixed and moving electrodes *b*, *c*, are of tubular form, with slots for the passage of air, and central arcing rods *d*, *e*, on which the arc is concentrated by the inward radial flow of air at *a* and its subsequent parallel flow upwards and downwards. Using air at from 4 to 6 atm. guage pressure, this type of switch is capable of interrupting about 15,000 A at 10kV or 10,000 A at 30 kV, 3-phase. Tests on a particular switch correspond to a breaking capacity of 400,000 kVA at 18 kV, 50 cycles, the arc being extinguished in half a cycle, and the air consumption being only 2.65 cu. ft. of free air per pole compressed to 5 atm. guage pressure.

The compressed-air switch is recommended for use where a number of circuit-breakers are required in one plant, particularly if the actual operation of the switches is by compressed air. The water switch is suitable for individual installation, especially where no provision for remote operation is required; but it is limited to pressures up to about 20 kV and is not suitable for use outdoors.

High-speed Photography

ULTRA-RAPID motion picture equipment which takes up to 2,500 photographs per second and at the same time records the action time in one-thousandths of a second has been developed jointly by Kodak, Ltd., and the Western Electric Co., Bush House, Aldwych, W.C.2.



The Kodak-Western Electric high-speed camera

The three main elements are a high-speed motion picture camera, a high-precision electric clock, and a frequency generator employing a tuning fork to control the a.c. actuating the clock mechanism. The camera uses standard 16 mm. reversal safety film and has two lens systems, so arranged that the moving dials of the electric clock are simultaneously photographed upon each frame of film beside the picture. The camera is available in two models, one taking up to 250 and the other from 300 to 2,000 frames per second. Speed is controlled by a rheostat in association with a series motor which for short periods can be subjected to considerable overvoltage so that it runs at about 20,000 r.p.m. Internal gearing of the camera increases this speed up to 80,000 r.p.m. on the shaft which rotates a plane parallel prism. Since two images are registered on the film at each revolution of the plane prism, it follows that the linear speed of the film can be about 160,000 pictures per minute, or approximately 2,600 pictures per second. In practice, excellent photographs have been secured at 2,000 frames per second, which when projected at normal speed give slow motion pictures about a hundred times slower than the original action.

The precision timing electric clock has two concentric dials, one rotating once a minute and divided into 60 divisions for seconds, and the other rotating once a second and graduated into 500 divisions (corresponding to 0.002 second). Each division is further subdivided by a diagonal line which when read with reference to a stationary central vertical line permits time readings down to one-thousandth of a second. The dials are actuated by a specially developed salient pole electric motor driven by a.c., the frequency of which is regulated by a thermostatically controlled tuning fork calibrated to 200 c.p.s.

Extreme Accuracy

For periods not exceeding two minutes the accuracy of the timing system with reference to the total time elapsed is within 1/200 of a second; for longer intervals the precision is within one part in 25,000. In comparing closely adjoining pictures these limits do not apply and it therefore becomes feasible to read to one-thousandth of a second in such cases.

For observing the position of the clock dials two windows are cut in a plate which is turned to reset the dials after each occurrence has been timed. One of the windows, illuminated by two automobile head lamp bulbs and small condensing lenses, is directly under the auxiliary lens and prism system, and reveals the dials recording absolute time. It is the image of this window which is photographed upon the film; the other is visible to the operator. The clock may be started or stopped by two push keys on the clock base, so arranged as to discharge polarised condensers in opposite directions, and thus actuate relays which engage pawl and ratchet clutch mechanisms which in turn positively start or stop the clock dials. Alternatively the timing system may be started by a switch remote from the camera.

The frequency generator is a portable unit containing an automatically temperature controlled tuning fork and an amplifier to increase the output level for the operation of at least two motor clock units. The primary purpose of this unit is to provide a sufficiently precise basic time rate for the system, and a secondary service is to provide operating current for the circuit. The tuning fork vibrates at 200 cycles per second, the vibration being started and sustained by the interaction of magnetic coils. Its temperature is controlled by electric heater elements which are in turn controlled by a mercury column thermostat embedded in the metal of the fork. The fork assembly is sealed in a heavily heat-insulated metal enclosure. This heat regulation is such as to permit the fork to maintain the required precision of one in 25,000 over a temperature range of −20 to +120° F.

The Radio Research Board's Work

THE activities of the Radio Research Board during the year 1932 and most of 1933 are reviewed in a report just issued by the Department of Scientific and Industrial Research (Stationery Office, price 2s. 6d. net). A separate report was not issued for 1932 in order that the amalgamation of the research station at Slough with the Radio Department of the National Physical Laboratory at Teddington might be dealt with in more detail.

Special attention has been devoted to the travel of wireless waves, which has involved intensive observation of the "ionosphere" and the report describes the development of new methods of "echo-sounding" by which observers on the ground can explore the electrical condition of the atmosphere at heights of 60 to 150 miles. One reason for the intensive nature of the work was the incidence of the "Second International Polar Year" in which scientists of various countries were engaged in a thirteen-month study of the conditions in polar regions and a comparison with those in other latitudes. As the end of this special year's work almost coincides with the period covered by the report, the results are at present of a preliminary character, since their complete analysis must take some time.

Thunderstorms and Ionisation

The general conclusions which appear to be emerging from these experiments are that ultra-violet light from the sun accounts for the normal ionisation of the two main regions of the ionosphere and for daily and seasonal variations in its intensity. At the same time there appears to be strong evidence that "abnormal" variations in the ionisation of the lower region, which occur mainly at night and during magnetic storms, can probably be best accounted for by the hypothesis that charged particles enter our atmosphere from outside and are carried towards the poles by the action of the magnetic field of the earth.

A further interesting discovery is the indication of a correlation coefficient as high as 0.75 between thunderstorm activity and the increase in ionisation in the lower layer, suggesting that thunder clouds contribute to the ionisation of the ionosphere, either through intense ionisation currents or lightning flashes. Recently proof has been obtained that when a wireless wave reaches the ionosphere it is, in general, divided into two parts by the action of the earth's magnetic field, and these two components, two waves as it were, are returned to earth with a rotational spin, in opposite directions. Moreover, the two do not generally take the same time to travel back to earth, one being more heavily delayed than the other. The interference between these waves accounts for much of the fading of long-distance communication, especially on short waves.

Transatlantic Telephony

Collateral work of a more immediately practical nature is proceeding on the long-distance traffic routes of the short-wave transatlantic telephone. New instrumental methods of measuring the angle of atmospheric reflection are described, including methods by which it is possible to analyse the arriving signal into the various rays of which it is composed and to measure the angle at which each of these waves arrives back to earth.

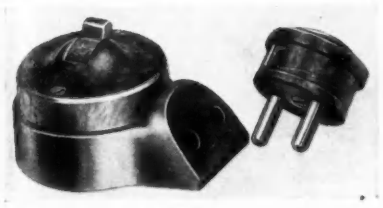
Direction-finding may be subject to considerable errors which are due to the condition of the waves returned from the ionosphere after dark when it becomes a more active reflector. Moreover, recent work has shown that with shorter waves, which are coming increasingly into use, the effect of these conditions is by no means confined to night time, but persists throughout the day. The development of instruments which are immune from the effects of these conditions is described in the Board's report. Other practical direction-finding improvements consist in methods of utilising the cathode-ray oscillograph, a particularly neat form being a small and compact receiver designed for the prevention of collision at sea in conditions of fog and low visibility generally. This apparatus is designed to work on specially short and widely spaced signals which need not interfere with existing traffic, even on the same wavelength, but which would still give the navigator a clear indication of any nearby vessel likely to form a risk of collision.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A New Tumbler Switch

"Efesca-Pearlette" is the name which has been given to a new tumbler switch developed by MESSRS. FALK, STADELMANN & CO., LTD., 83/93, Farringdon Road, E.C.1. The underslung movement has a q.m. and b. action, and the vitreous porcelain base has a "Duroid" shock-proof cover and square dolly. The surface type, fitted with a walnut cover, costs 10s. a dozen with a white base. A brown base costs 6d. per dozen extra and a white "Duroid" cover 3s. 2d. extra. A two-way action can be obtained for 5s. 4d. extra. The prices for the semi-recessed type are 4d. per dozen more in all cases. A sunk switch with a walnut or white "Duroid" plate is also available and there is also a switchplug with an angle-entry base priced at 24s. 8d. per dozen with a brown base (white base 4s. 8d. extra).



The "Efesca-Pearlette" switchplug

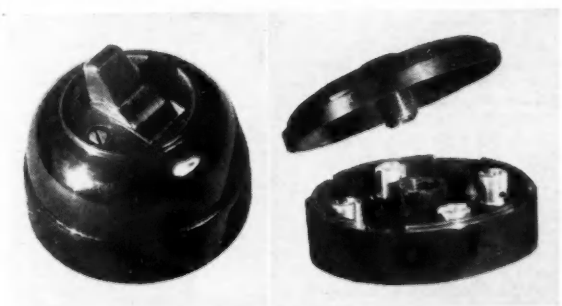
Becker Switches and Plugs

Included in a range of new bakelite accessories made by GEO. BECKER, LTD., Ampère Works, Exhibition Grounds, Wembley, Middlesex, are switchplugs, switches and junction boxes. The last-named are of neat design, and special thin "knock-outs" provide from one to four ways. The 3-in. diameter type cost 11s. per doz., and the 2¼-in. 9s. per doz.

Both surface and semi-recessed one- and two-way "Corporation" switches are available at the same price. They embody a special movement giving a quiet yet positive action. The 2-in. bases are made of best quality vitreous porcelain, and the insulated covers are held in position by two unloseable screws. The metal parts are of machine finished brass, and the price of the standard brown model is 7s. per doz. (one-way) and 10s. per doz (two-way).

A 15-A switchplug with a porcelain base has been introduced. Again the cap is fixed by two unloseable screws, and both two-pin (5s. per doz.) and two-pin-and-earth (80s.) are available. In the case of the three-pin type the contact pins are insulated ¼ in. up from the base to guard against shock.

The "Top-Entry" switchplugs are of neat design and are sold with plugs at 18s. per doz.



A new Becker switch and junction box

An Electrical Publicity Machine

An ingenious electrically operated leaflet-distributing machine has been introduced by MESSRS. PEARSON BROS. (NOTTON), LTD., Long Row, Nottingham. It consists of a box about 2 ft. 6 in. high, 15 in. wide and 12 in. deep, with a glass aperture a few inches in diameter above which is the injunction "You must look into this."

The machine can be operated three ways. By pressure on a mat in front of the machine; by a photo-electric cell, so that anyone looking into the aperture interrupts the ray and operates the machine; or, probably the most effective method of all, by displaying a notice inviting the public to ask the machine for a list, mentioning that the word "please" must be used. In this case a microphone is situated inside the aperture and, when vibrated through a person speaking, operates the machine so that the leaflet slides out at the bottom of the machine.

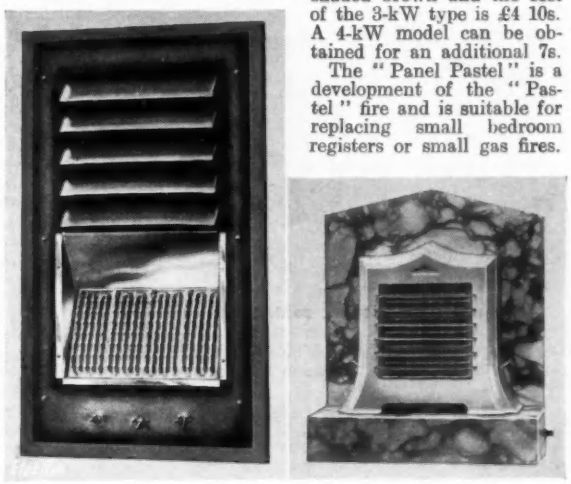
Tests have shown that the public is usually so struck by the novelty of the machine that people operate it two or three times although they only take one leaflet away with them, and it is therefore advisable to have a box placed near the machine to hold the leaflets which are not taken away.

One of these machines is installed outside the company's own store and is used about a hundred times a day. Such a machine would appear to lend itself very well to stores which have periodical sales and issue special sale catalogues.

Inset Fires

The 1934 inset fire catalogue issued by ROWLANDS ELECTRICAL ACCESSORIES, LTD., Hockley Hill, Birmingham, 18, contains several new models. Among these is the "Louvre-set," a distinctive fire suitable for hotels and clubs as well as domestic use. Two amber sprayed lamps are situated behind the top louvre, giving a cheerful effect; the standard finish is gold shaded brown and the cost of the 3-kW type is £4 10s. A 4-kW model can be obtained for an additional 7s.

The "Panel Pastel" is a development of the "Pastel" fire and is suitable for replacing small bedroom registers or small gas fires.



The "Louvre-set" and "Panel Pastel" fires

The fire frame is a porcelain enamel casting mounted on a plinth with a surround of sheet metal, and a variety of colours is available for both the 2- and 3-kW models, which cost 39s. 3d. and 52s. respectively.

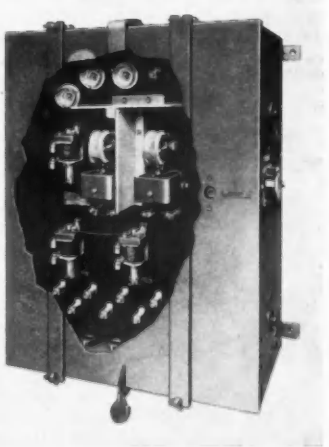
Other newcomers are the "Shield-set" (2 kW, 25s., with two switches); and a chromium-plated inset (1-, 2- and 3-kW at 19s. 9d., 28s. 6d. and 30s. 6d. respectively). Sheet-metal panel surrounds measuring 20 in. by 28 in. and priced at 22s. 6d. are available for the company's "Shield" or "Chrome" inset fires. The standard finishes are walnut, oak and mahogany.

Protective Panels for Crane Motors

A new range of totally enclosed protective panels for a.c. and d.c. crane motors up to 550 V offered by the BRITISH THOMSON-HOUSTON CO., LTD., Rugby, includes the types "AMC" and "DMC" contactor pattern and the types "AKC" and "DKC" switch and fuse pattern.

A typical contactor equipment comprises a double-pole d.c. or triple-pole a.c. line contactor circuit-breaker with renewable contact tips, blow-out, and arc-chutes; magnetic over-current relays, each provided with an inverse time-lag device to prevent tripping on momentary overloads of small magnitude; push-button switch for resetting the line contactor circuit-breaker; and two double-pole switch-fuses with external operating handles, one for the control of the contactor operating-coil circuits and pilot-lamp, and the other for the hand-lamp circuit. All the components are mounted on an "Ebony Sindanyo" base within a sheet steel case with corner feet for mounting on any convenient portion of the crane. On the side of the case is mounted a weather-proof switch-socket and plug for the portable hand-lamp circuit.

If desired, the push-button switch and the two double-pole switch-fuses can be mounted on a separate sheet steel base forming an auxiliary control panel. When an ammeter and voltmeter are required they are mounted on the top of the enclosing case; such instruments are of the moving-iron, gravity

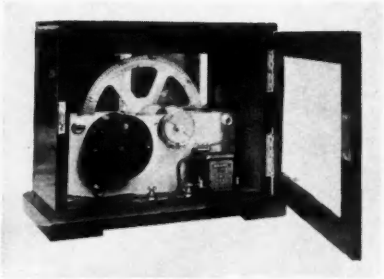


D.c. protective panel for two-motor crane; cover broken away to show interior

controlled pattern both for a.c. and for d.c. circuits. The switch and fuse comprise a double-pole d.c. or triple-pole a.c. hand-operated main switch in association with rewirable fuses for the main circuits, double-pole switch-fuse with external operating handle for controlling the hand lamp circuit, and pilot lamp socket and fuses, enclosed in a sheet-steel case designed for vertical mounting. The front cover is so interlocked that access to the interior cannot be obtained unless the main switch is in the "off" position.

A Synchronous Electric Bell Controller

Recently, there has been introduced by SMITH'S ENGLISH CLOCKS, LTD., Cricklewood Works, N.W.3, a system for the automatic operation of bells, hooters, and other electric warning devices. The bell controller is designed to operate from time-controlled a.c. mains, and works much in the manner of the modern synchronous electric clocks. It will close a given circuit at any or every one of five minute intervals for a period of approximately seven seconds, and is set for ringing at the desired times by means of small contact pins set into pierced and calibrated dials. A switch is provided by which the circuit can be made inoperative for any period up to three days in a week.



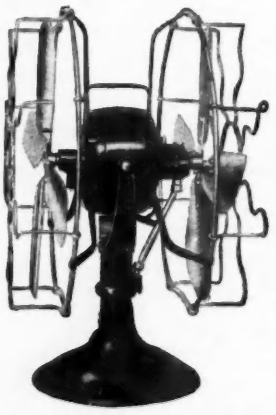
The Smith electric bell controller

Once the programme of operation is set, the controller requires no further attention. It is suitable for offices, hotels, licensed houses, schools, businesses and institutions where definite time tables and time intervals are observed; the price is 16 guineas.

Some New Season's Fans

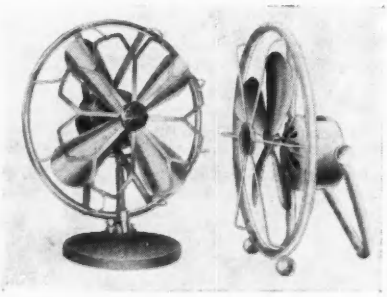
The new type DR-14 "Duo-revolving" table fan made by MARELLI & CO., LTD., 19, Garlick Hill, E.C.4, has two sets of 14 in. blades and guards fitted at each end of the motor shaft and rotates through a complete circle about eight times per minute.

The regulator is fitted in the base and gives four operating speeds and "off" position, and the mechanism consists of a worm on the motor shaft meshing a worm wheel on which axis a telescopic transmission rod with ball joint is fitted; the latter in turn drives a pinion engaging a fixed gear on the pedestal, thus causing the rotation of the fan motor. The worm drives the telescopic rod through a ball clutch so constructed that it will slip automatically should the fan meet an obstruction whilst oscillating, thus preventing injury to the fan. The revolving motion may be stopped or resumed by the simple turning of a lever which engages or disengages the worm drive.



The Marelli "Duo-revolving" fan

A.c. models are available loaded at 96 W and d.c. models at 50 W; both types revolve at about 1,200 r.p.m. and both are capable of delivering 2,300 cubic feet of air per minute.

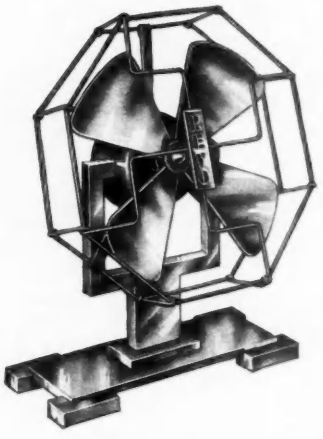


The Gilbert "Aristocrat" and Sun "Elite" fans

The 1934 range of fans being marketed by the SUN ELECTRICAL CO., LTD., 118-120, Charing Cross Road, W.C.2, includes the "Elite," a three-position fan which can be used for attachment to the ceiling or wall or on the desk. The price is £2, and the motor, which is of the induction type suitable for 50-cycle supplies, drives 8-in. brass blades mounted in a white enamelled frame with rubber feet.

The "Aristocrat" is a new design made by A. C. Gilbert and Co. and marketed in this country by the SERVICE EQUIPMENT CO., LTD., 99, Albion Street, Leeds. The special features which are common to the 8-, 10- and 12-in. models are the suspension of the motor from a heavy ring mounted on the base to eliminate vibration, automatic adjustment and the unusual design of the chromium plated guard. Crystalline enamel finish is standard, and a "two-speed and stop" switch is fitted; the motor is suitable for a.c. supplies (50 cycles) only, and the prices of the three models are 50s., 63s. and 80s.

The "Barbican" is a new fan marketed by the SLOAN ELECTRICAL CO., LTD., 8/12, Golden Lane, E.C.1. It has 8-in. diameter blades, and all metal parts are chromium plated, the base and standard being finished in dark green enamel. A push-button switch is fitted in the base, and the fan is arranged on an adjustable standard. The price is £1 6s. 8d.

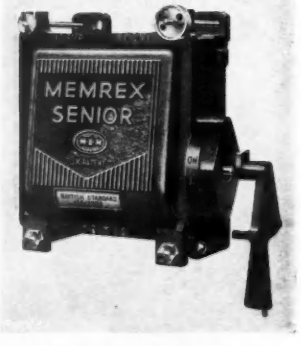


The Revo "Aero" fan

The new season's fan catalogue issued by the REVO ELECTRIC CO., LTD., Tipton, Staffs, contains, besides an improved "Elite" fan, an entirely new model known as the "Aero." It is designed on modern lines and is fitted with a universal motor, models for 200/220 V or 230/250 V systems being available. The loading is 20-25 W, and the speed 1,800 r.p.m., displacing 450 cu. ft. of air per minute. Complete with 3 yd. of flexible cable and an adaptor, and finished in sprayed gold or bronze with polished brass guard and blades, or all sprayed aluminium, this design of fan costs 35s. 6d.

Neon Sign Switches

Two new switches for neon sign control have been introduced by the MIDLAND ELECTRIC MANUFACTURING CO., LTD., M.E.M. Works, Barford Street, Birmingham, 5, to comply with I.E.E. Regulations Nos. 145 and 146. The first Regulation requires the switch to be operated by a key handle which can only be removed when the switch is in the "off" position. Type "1215AS" is a d.p. 15-A weatherproof switch which complies with this requirement. It has a removable handle which also forms a special key for unlocking the cover of the switch and costs 9s. 4d.



"Memrex" switch for neon signs

Type "1215AF" complies with Regulation No. 146. It is enamelled red and is fitted with a handle suitable for pole operation, the price being 8s. 8d.

A Synchronous Electric Stop Clock

MESSRS. FERRANTI, LTD., Hollinwood, Lancs, utilise their new self-starting synchronous motor for driving purposes in a useful electrical stop clock which has been introduced recently. The main pointer moves smoothly over a 6 in. diameter dial at the rate of one revolution in 10 seconds, whilst a subsidiary pointer reads up to 10 minutes. Thus, reading to half a division, operations can be timed to 1/20th second. Other speeds can be arranged without difficulty up to one revolution per minute for the larger of the pointers.

Both pointers can be reset to zero instantaneously by depressing the knob which projects from the side of the case and engages with two heart-shaped cams. Starting and stopping errors are avoided as the motor runs continuously, the clock being set in motion by a clutch operated electrically by external means. Two pairs of terminals are provided, one pair for the motor, 200-250 V, 50 cycles, and the other for the clutch, the coil of which can be arranged for any convenient voltage, a.c. or d.c. The clock is for use preferably with its dial horizontal.

The Ferranti stop clock

Direct Mail Advertising. By William F. Jarvis

THE electricity undertaking has five main ways of advertising at its disposal, namely:—The Press; the poster; the cinema; house-to-house distribution; and direct mail. Dealing first with newspaper advertising, it is agreed that the popular Press is an ideal medium for national propaganda, and good results can be obtained from this form of publicity, providing big money is spent. The average undertaking will find, however, if it takes the trouble to key its advertisements, that results do not reach the expected standard.

The poster and cinema are good media for local advertising, especially if the posters are illuminated at night, while in the cinema we get people who, by the very fact that they are there, must be in a receptive state of mind. But unless exceptional care is taken with the design and execution of posters and slides, results will be unsatisfactory. Posters, for instance, are more suited to tangible articles of merchandise than to intangible utilities.

Mr. W. F. Jarvis is showroom and sales superintendent to the Bury Corporation Electricity Department

House-to-house distribution is out of the question on the score of economy, and also the fact that circulars distributed by this method often fall into the hands of children and never reach the husband or wife. Again the human element enters largely into this form of advertising, resulting in some houses receiving three or four circulars whilst other houses are missed.

We are left, therefore, with direct mail advertising, which may be defined as a comprehensive method of personal advertising that reaches the people that it is desired to reach. It is capable of creating a demand for goods, it can ensure consumer satisfaction, it can create consumer good will, and it can bring back lost customers. It is plain therefore, that used rightly, it is a powerful and flexible advertising medium.

Direct mail advertising must not be confused with mail-order advertising, which is used by the large departmental and chain stores, nor should it be likened to circularising which means the indiscriminate despatch of catalogues and booklets to consumers. Most of us are aware of the fate which awaits most booklets, catalogues and leaflets that arrive uninvited. There is an old and true saying that that which is got for nothing is worth exactly what it costs. By the skilful use of direct mail advertising, consumers can be induced to ask for a booklet, and it is certain that the recipient is more likely to read and digest literature asked for than if the booklet had arrived uninvited.

How to Write the Letter

Many authorities have no doubt tried what they consider to be direct mail advertising, that is, they have despatched a letter hurriedly designed and have probably enclosed one or more pamphlets. Then they have been dissatisfied because results have fallen far short of expectations. The haphazard way of direct mail advertising is the surest way of losing the money expended. Great care must be taken with the design of the letter and the paper used and the following questions must be answered:—

(1) What are the characteristics of the consumers to whom the letter will be sent?

(2) Is it the right time to send out the intended letter?

(3) What advantages have the appliances offered over competitive goods or appliances at present used by the consumer?

The letter should consist of the opening; the body of the letter; and the "clinch." (Never close a sales letter without giving the reader some definite thing to do and a good reason for doing it.) It is plain therefore, that the successful sales letter must gain attention, hold it, and then create desire in the prospect's mind.

Intending direct mail advertisers should avoid at all costs, the abominable term "Dear Sir or Madam." If your mailing lists consist of both sexes, commence some of your letters "Dear Sir" and some "Dear Madam." In designing the letter, the writer must avoid any involved, abstract or negative terms in favour of simplicity, concreteness and positiveness. When the letter is being constructed, the goods or booklets to be offered should be before the writer and the letter should be composed for one person only.

The right length for a sales letter is the smallest number of words which will tell the story. It will be plain to all intending direct mail advertisers that the sales letter must possess more inherent salesmanship than a spoken appeal, for the very good reason that the recipient of the sales letter has more time to think out reasons against obeying its suggestions. The fact that letters are often carelessly drafted is the explanation of their failure to sell goods. It can be emphatically stated that the right letter will sell whatever ought to be sold by it. Intending direct mail advertisers must appreciate that the finished letter will be a winner or loser according to the amount of analytical thought brought to bear on it at every stage. In a letter, just as in a personal interview, first impressions are important, so care should be taken in the grade of paper used and also the heading.

Gauging the Effect

The obvious question which the intending direct mail advertiser will ask is: "Is there any way I can test my letter before sending it out in thousands?" The answer is in the affirmative. There are two main points to be ascertained: whether the letter is satisfactory and whether the right class of consumer is being approached.

As an example of a letter which has given good results, I reproduce below a communication sent by my undertaking to every consumer who installs a cooker under the hire-purchase scheme:—

Dear Madam,

We had the pleasure of supplying you with an electric cooker some time ago and sincerely trust that it is giving you every satisfaction.

You will remember we pointed out that you could switch the oven right off for the last 20-30 minutes when cooking certain dishes. Other dishes require the full heat. But even then, after you have switched off the oven, the retained heat that is left is sufficient to cook a small milk pudding or stew fruit, or you can warm a bowl of water for washing dishes.

We hope the cookery book included with your cooker has been useful. If, however, you have any difficulty whatever, as regards using the cooker or cooking certain dishes, do not hesitate to let us know, when we will obtain for you the services of an experienced demonstrator at no cost to yourself.

Do not forget we are always at your service.

Yours faithfully

It is a wise procedure for the test to comprise 10 per cent. of the total number of names on the list that is to be used. It must be borne in mind that whatever the proposition is, only a certain proportion of people will reply. In our case, where we are offering a booklet, 10 to 15 per cent. would be considered a fair number of replies.

A further query that arises is whether a 1½d. or a ½d. stamp should be used. It can be emphatically stated that the results in many campaigns have been practically identical, when some "shots" have been sent out bearing 1½d. stamps and others with ½d. stamps. It appears, therefore, that this question does not have any important bearing on the success of the letter, and that a ½d. stamp can be used.

Carbon Bi-sulphide Risks

THE Home Office Factory Department has issued a memorandum on "Precautions against Dangers of Poisoning, Fire and Explosion in connection with the use of Carbon Bi-sulphide in Artificial Silk, India-rubber, and Other Works" (Form 836, Stationery Office, 3d.). Where carbon bi-sulphide is used or stored, advisable precautions are:—(1) Flameproof construction of motors, control gear, lighting, and switches, to the appropriate B.S.S. or their location outside the room in which CS_2 is present. Where motor switchgear only can be placed outside, flameproof push-buttons should be placed near the motors or driven machines for emergency stopping; lamps must not raise the temperature of fittings to approach 125 deg. C. (2) Portable electric lamps fed from the supply mains should not be used; no electric handlamp or other type of miner's lamp has yet been certified for such atmospheres. (3) Wiring should be enclosed in solid-drawn steel conduit with flameproof junction boxes, or be carried out continuously in metal sheathed or armoured cable attached to the apparatus by proper joints. (4) Distributor fuse boards should not be inside the room where CS_2 is present. (5) Electric heaters, unless of flameproof construction, should also be excluded; if of flameproof construction, the external temperature of the enclosure should not approach 125 deg. C. Static electricity may be generated by flow and agitation of CS_2 in pipes and tanks and cause sparking unless metal pipes and tanks are bonded at all joints and earthed; static charges are also dissipated if the relative humidity of the atmosphere does not fall below 60 per cent.

Canadian Electrical Trade during 1933

Imports down: exports greater

THE Canadian Government has just issued returns of the foreign trade of the Dominion for the calendar year 1933. From these have been extracted the following figures showing the value of imports and exports in that year, with a note of increases or decreases as compared with the preceding year.

The total value of the imports of electrical apparatus, lamps and fixtures was last year only $5,249,000, a decrease of $2,459,000. At the same time Canada's exports of electrical apparatus totalled $1,878,000, as compared with $1,317,000. It will be seen that the value of Canada's exports of such goods to the United Kingdom is now greater than that of her imports from this country. It is officially estimated that over 90 per cent. of the electrical apparatus and supplies used in the Dominion is now produced by Canadian manufacturers. The latest figures of production are for 1932, when the total value of the output of the electrical manufacturing industry was given as $53,265,000, in addition to $10,145,000 representing similar products made in other Canadian industries. In 1931-32 there was a decline in the output of electrical apparatus in the Dominion, chiefly because the general business depression led to a decline in the consumption of power. But the recovery in 1933 created a renewed demand for apparatus and supplies.

	1933. Thous. $.	Inc. or dec. Thous. $.
IMPORTS		
Batteries, primary and parts—		
Total	92	− 42
From United States	90	− 41
Batteries, storage—		
Total	113	− 119
From United Kingdom	39	− 95
„ United States	74	− 24
Heating apparatus—		
Total	88	− 102
From United States	87	− 97
Dynamos or generators—		
Total	394	+ 151
From United Kingdom	18	− 21
„ United States	119	− 78
„ Switzerland	253	+ 253
Fuses, plugs and cutouts—		
Total	48	− 3
From United States	47	− 3
Lamps, metal filament —		
Total	53	− 5
From United States	37	+ 16
„ Japan	15	− 19
Flashlights, torches, head, side and tail lights—		
Total	269	+ 1
From United Kingdom	2	− 1
„ United States	262	+ 21
„ Germany	2	− 8
„ Japan	1	− 8
Lighting fixtures and appliances—		
Total	145	− 113
From United Kingdom	11	+ 1
„ United States	124	− 105
„ France	1	− 3
„ Germany	3	− 3
Meters, electric—		
Total	71	− 63
Steam turbo-generator sets, 700 h.p. and greater, of a kind not made in Canada—		
Total	96	+ 68
From United Kingdom	85	+ 80
„ United States	9	− 13
Motors—		
Total	595	− 488
From United Kingdom	116	− 94
„ United States	469	− 369
„ Sweden	5	− 21
Rheostats, controllers, &c.—		
Total	174	− 59
From United Kingdom	16	− 5
„ United States	157	− 54
Spark plugs, magnetos and other ignition apparatus—		
Total	192	− 96
From United Kingdom	19	− 30
„ United States	170	− 64
„ Germany	1	− 1
„ Switzerland	2	− 1
Switches, switchboards and circuit breakers—		
Total	303	− 233
From United Kingdom	31	− 21
„ United States	271	− 205
Telegraph apparatus—		
Total	46	− 228
From United Kingdom	2	− 4
„ United States	44	− 224
Telephone apparatus—		
Total	203	− 270
From United Kingdom	27	− 26
„ United States	174	− 244
Transformers and parts complete—		
Total	51	− 282
From United Kingdom	22	− 235
„ United States	28	− 47
Radio tubes—		
Total	84	+ 24
From United States	84	+ 31
Radio apparatus—		
Total	1,109	− 190
From United Kingdom	44	+ 3
„ United States	1,064	− 191
Other electrical apparatus—		
Total	986	− 361
From United Kingdom	58	− 31
„ United States	908	− 311
„ Germany	5	− 1
„ Switzerland	13	− 15
Electrical apparatus, lamps and fixtures—		
Total	5,249	− 2,459
From United Kingdom	518	− 503
„ United States	4,395	− 2,095
EXPORTS		
Batteries, storage—		
Total	144	+ 16
To New Zealand	30	− 9
„ Argentina	57	+ 27
Other batteries—		
Total	70	+ 15
To United Kingdom	12	− 8
„ New Zealand	50	+ 22
Telegraph, telephone and radio apparatus—		
Total	358	+ 99
To United Kingdom	228	+ 88
„ Australia	34	− 31
„ New Zealand	30	− 10
„ Brazil	34	+ 10
Dynamos, generators and motors—		
Total	57	+ 24
To United Kingdom	48	+ 27
Domestic cooking and heating devices—		
Total	651	+ 291
To United Kingdom	54	+ 29
„ Irish Free State	124	+ 119
„ South Africa	399	+ 125
„ New Zealand	36	+ 12
Spark plugs, magnetos and other ignition apparatus—		
Total	427	+ 109
To United Kingdom	246	+ 50
„ South Africa	30	+ 12
„ Australia	64	+ 38
„ New Zealand	24	+ 5
Other electrical apparatus—		
Total	172	+ 8
To United Kingdom	35	− 16
„ Brazil	15	+ 2
„ Chile	12	+ 12
„ Mexico	45	+ 5
Total of elec. apparatus—	1,878	+ 561
To United Kingdom	624	− 172
„ United States	21	− 14

In the Courts

WILLIAM McELROY, coal contractor, of Iddesleigh House, Caxton Street, S.W.1, was found "Not Guilty" when he was charged at the Central Criminal Court on Wednesday and Thursday last week with obtaining money from the Poplar Borough Council by false pretences.

Mr. Gerald Dodson, who appeared for the prosecution, said that the accused had since 1922 carried on business as a coal merchant at Caxton Street, and had been in a large way of trade up to April, 1934, when his business was changed into a limited company. For a period of years he had supplied coal to the electricity undertaking of Poplar Borough Council. He had supplied directly and indirectly by selling it to other coal factors who in turn supplied it to the Council. In 1927 a new pulverising plant was installed at Poplar and it was found that the coal which had been supplied by various contractors, including accused himself, was unsuitable for that plant and it was decided that the coal which would give the best results at the proper price was Durham coal. The charge was that accused, in the years 1931-32 and 1932-33, pretended to be supplying Durham coal whereas in fact he was supplying a cheaper grade, namely Northumberland coal.

Mr. Clement Gibson, the District Auditor, gave evidence, and Mr. Martin, Borough Treasurer of Poplar, produced invoices and cheques relating to the purchase of the coal.

Mr. Lawrence Clermont, assistant electricity accountant to Poplar Council, said that so far as he was concerned he had never had to make any complaint about the coal. It was efficient for the purpose. Mr. C. W. Coppinger, station superintendent, electricity works, Poplar, said that he would describe the coal supplied by Messrs. McElroy as a good rough slack. Mr. P. Westlake, assistant station engineer, said that he would describe the coal from Messrs. McElroy as a good nutty slack. About 25 to 30 per cent. was dust or fines. Mr. H. Cooper, managing director of Messrs. William Cory, coal merchants, said that he would apply the term graded coal to Northumberland rough slack as it had been measured. In 1931 Durham peas were priced at 15s. 6d., f.o.b. port of lading, and Northumberland rough small at 9s. 6d., 10s., and 10s. 6d. The freight charges to Poplar would be about 6s. 9d. extra.

Putting the case for the defence Mr. Oliver said that the defendant had two sons, one of whom, William Eric, was no longer in the country. The way he had treated this son was to say that he should have 100 per cent. on all the contracts he obtained, and that he, the father, was prepared to carry all the overhead charges. The Poplar coal contract was obtained by this son, who took all the profit, and for five years the defendant had nothing to do with it. That was his defence to the first part of the charge, that dealing with the first of the tenders. That his son, who made the contract with Poplar, misrepresented the coal there was no question. During 1931 he left the country and in January, 1932, the question of renewing the Poplar contract came up and the father had an inkling for the first time of what had been happening. He saw that his son had been pretending to contract for Durham peas, when he knew that he had never had any. That was a wretched position for a father to find himself in.

He went to see Mr. Bowden, the chief engineer, and told him what had happened and that he had only just found it out. Bowden said "It doesn't matter where it comes from; it is splendid coal. I want you to go on supplying it." McElroy said that he would not supply it as Durham coal, and Bowden said in effect that that would be awkward for his son and for him (Bowden). Between them it was agreed that the tender should be filled in, and in order to protect Mr. McElroy the words "and/or equal quality" were added to "Peases or Pelaw Main" for the first time. It had been said that Mr. McElroy was getting Durham prices but that was not true. The coal which was the best kind of Northumberland nuts cost 12s. 6d., and expenses were 7s. 3½d., which brought the cost to 19s. 9½d. by the time it arrived at Poplar. For these

Northumberland nuts 22s. 7d. was a perfectly fair price to pay.

Mr. McElroy then went into the witness box and gave evidence to this effect. Two coal merchants gave evidence on the subject of what the words "and/or of equal quality" meant, and the jury returned a verdict as stated.

Damages Against the I.F.S. Electricity Board

In the Dublin High Court last week, Mr. Justice O'Byrne made a consent a rule of court in the case of William Reddy and Bridget Reddy, of Raheny, County Dublin, against the Electricity Supply Board.

Mr. P. McGilligan, B.L, who made the application, *ex parte* on behalf of the defendants, said that on the night of the big storm in February, 1933, an electric line, the defendants' property, was blown down at Raheny. A little daughter of the plaintiffs came into contact with the wire and was killed. Her mother, Bridget Reddy, ran to the child's aid, but herself came into contact with the wire, and was rendered unconscious. She sought damages for personal injuries, and her husband, William Reddy, claimed for loss and expense. No action for damages had been taken with regard to the child. The consent provided for payment to plaintiffs of £200 for damages and £75 for costs.

Claim for Colliery Electrical Equipment

Mr. Justice Roche, in the Commercial Court on June 8th, concluded the hearing of an action brought by Mr. Ernest Ridgill (trading as the Mining Appliances Co.), of Bedford, to recover from the Houghton Main Colliery Co., Ltd., Houghton, Yorks, £338 19s., the price of an electric driving gear for a belt conveyor for the purpose of conveying coal along a "gate" in a process of machine mining sold and delivered to the defendant company.

The defence was a denial that defendants bought the driving gear and an allegation that all they had done was to arrange to have it on trial and that after having it for a reasonable time they decided not to keep it. Alternatively, defendants pleaded that if they did buy the driving gear there was an implied warranty of fitness which had been broken.

After hearing the evidence, his Lordship said that the defendants had had the driving gear for more than twenty-eight days, and he therefore arrived at the conclusion that the trial period had terminated. In these circumstances he held that the price of the machine was due to the plaintiff. With regard to the question of the alleged implied warranty he thought that the defendants bought the machine on the reliance of a three weeks' trial and not on any warranty given by the seller. It having been agreed that the plaintiff would take back the machine other than the motor, which the colliery company would keep, the plaintiff had consented to make an abatement of £100; therefore there would be judgment for him of £258 19s. on the claim with costs, the defendants undertaking to return the machine other than the motor forthwith. His Lordship also dismissed a counterclaim by the defendants for damages with costs.

Mullard v. Philco

In the Chancery Division on May 31st Mr. Moritz, K.C., applied to Mr. Justice Farwell for a day to be fixed for the trial of an action brought by the Mullard Radio Valve Co., Ltd., against the Philco Radio and Television Corporation of Great Britain, Ltd. He said it was a patent action and would probably take nine or ten days to try.

After some discussion his Lordship fixed June 19th.

Winding-up Petition Dismissed

In the Companies Court on Tuesday Mr. Justice Crossman had before him a petition for the compulsory winding up of Neon Installations, Ltd. Counsel for the company said he understood that negotiations were proceeding with a view to a settlement of the petition, and there was every prospect of all the creditors being paid off. The company was quite solvent.

In the result, on an undertaking by the company to pay the debt, the petition was dismissed without costs.

Parliamentary News (BY OUR SPECIAL REPORTER)

THE Select Committee of the House of Lords, presided over by Lord Amulree, which devoted some days before Whitsun to the consideration of the Sheffield Gas Bill, announced its decision on June 5th, and ordered the insertion of a clause for the protection of the Yorkshire Electric Power Co.

The Sheffield Gas Co. sought by this Bill an enactment that no person other than the company should, without the consent of the company, supply coke-oven gas within the company's limits of supply. To this the Yorkshire Electric Power Co. objected on the ground that if it erected a generating station in the Sheffield area it could only obtain a supply of coke-oven gas as fuel from people who were its competitors in power supply and at the price fixed by those competitors.

Lord Amulree said the Committee would allow the Bill to proceed subject to the insertion of a proviso that the consent of the promoters should not be unreasonably withheld and that the question of what was reasonable should be determined in case of dispute by the Board of Trade, and subject to the insertion of a saving clause that the Bill should not operate in the case of the Yorkshire Electric Power Co. to prevent supply to that company by the owners of coke-oven plant.

Post Office Progress

On June 7th, during the discussion on the Post Office estimates, Sir Kingsley Wood, the Postmaster-General, said that telegraph traffic showed a small increase for the first time since 1919. So far as telephones were concerned the year 1933-34 had been a record for new business; the increase in trunk traffic had been doubled, and the Continental telephone traffic had reached more than 1,250,000 calls. It was estimated that the total surplus would reach a figure of £12,396,000.

The general improvement warranted a capital expenditure in development in the current year of £8,400,000, an increase of nearly £2,000,000 over last year's expenditure. This sum would be spent upon new telephone exchanges, trunk lines and apparatus, telegraph equipment, and other work. The reorganisation of the new telegraph service was nearly completed. There was a definite place for the telegram, and he was causing an investigation to be made in order to see whether it was practicable to make some alteration in the structure of the telegraph traffic which might have the effect of retaining and developing that traffic while improving the financial aspect of the service.

So far as broadcasting was concerned, the number of new licence holders did not yet appear to be exhausted, and on March 31st last there were over 6,250,000 licences in force. It had been arranged that the B.B.C.'s contribution to the Exchequer should be reduced to half as from July 1st. So far as television was concerned, he thought that there had been sufficient development to warrant the appointment of a special committee, under the chairmanship of Lord Selsdon, to examine the whole matter with a view to seeing what sort of service should be introduced as a result of that invention.

Considerable progress had been made in the national telephone service. Demand trunk calls could now be made throughout the inland system as well as to parts of the Continent. The quality of speech transmission had been greatly improved and the speed of the service had been much accelerated. About 37 per cent. of the total number of telephone lines were to-day on the automatic system. Much progress had been made in the rural areas. It was quite clear that large numbers were abstaining from coming on the telephone owing to the considerations of cost. Next October, therefore, it was proposed that substantial reductions in charges and important modifications in the conditions of the service should be made. The new group service which was announced at the beginning of this year already offered a comparatively low tariff, but it would now be possible to reduce the rates of that service even further. Other concessions included the return of excess deposits, abolition of the removal charge, reduction of the connection fee and reduction in the charge for the adoption of the hand microphone from £1 to 10s. The new rates would come into force generally on and from October 1st next as regarded both new and existing subscribers. During the interim period until October 1st it was proposed to give new subscribers the option of coming in on the new connection charge system.

The cost of these concessions would be about £750,000 in the present financial year and £1,500,000 in the following year, but they were made not only in the belief that by a bold policy they would greatly help telephone development in this country and be a real aid to trade and business but that they would meet with a considerable response and eventually bring in such additional revenue and business as would be ample justification for their introduction.

Improved Lighting in Mines

On June 12th Mr. Grenfell asked the Secretary for the Mines Department when the new code of regulations for mine lighting was to be put into force.

Mr. E. Brown said that these regulations were formally made on June 1, and would be published with an explanatory memorandum in the course of a few days. The general effect of the regulations would be to facilitate and require a substantial improvement in mine lighting.

[The draft regulations were reviewed in our issue of May 25th (p. 732).]

All safety lamps used at the working face and for other specified work in the face area must satisfy higher standards of candle-power, and these standards must be reasonably maintained in pit service. On haulage roads a carefully controlled extension of fixed electric lights was permitted, subject to new conditions designed to ensure safety against the risk of explosion; and whitewashing at junctions, passbyes and other important traffic points (as well as machinery rooms) was made compulsory. Other provisions of the regulations dealt with lighting at the surface and at shaft insets and sidings. One part of the new regulations would come into force on July 1st and the other parts on Sept. 1st, except that the period ending in September, 1936, would be allowed for the replacement of safety lamps now in use which fell below the prescribed standards.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Scottish Electrical Contractors

The annual conference of the E.C.A. of Scotland was again held at Taymouth Castle from Friday, May 25th, to Monday, 28th. The party of seventy-five members and ladies was welcomed by President David Bennett on Friday, and after luncheon the annual meeting took place. The report showed a membership of close upon 300. The Fair Trading Policy and the campaign in support of it, together with the new working rules and jobbing price list, were approved. Vice-president Shand seconded the adoption of the report. The following officers were elected: President, Major R. E. Douglas (see our "Personal" section); vice-president, Mr. H. G. Mackerron, of Mackerron & Scott, Ltd., Glasgow; secretary, Mr. W. Finlay. After appropriate remarks, the retiring president invested Major Douglas with the presidential badge. After dinner on Friday there was a dance. Saturday morning was devoted to a golf match—East *v.* West—and on a narrow win Mr. Fulton, the chairman of the Glasgow branch, took the Pratt Trophy back to the West. Conference proceedings were resumed on Saturday afternoon, when President Douglas discoursed on "Are We Different?" He considered that there was too great a tendency to view electrical problems from a narrow angle, but he submitted that practically the same difficulties had to be met with in other contracting and selling businesses. We all had the same job to do, to supply service and deliver the goods to suit the public who are, after all, the real employers. The butcher, the baker, the lawyer and the doctor, as well as the electrical contractor, all had to contend with the many varieties of human nature. A discussion followed.

Mr. H. M. Fulton, of Glasgow, the new chairman of the Glasgow branch, read a paper on electrical contracting problems, in which he dealt with the necessity of a Fair Trading Policy and the difficulties encountered in connection with labour and estimating. He urged the necessity of supervision and detailed tests and commended high standards. He mentioned that the continued talk of a fixed price per point was an evil, and said that architects should know the fallacy of such a suggestion. Inspectors under the National Register should help to raise the standard of work. Members should not merely satisfy prevalent regulations but should represent the craftsmanship of an industry still in a stage of rapid development. After Saturday dinner there was a whist drive and dancing. Sunday included a sermon on "Light" at the Old Kirk of Kenmore, motor-car tours amid the beauties of North Perthshire, the presentation of prizes, and a concert, and after the midnight hour a cabaret in the smoking-room of the castle.

Price Reductions

Santon, Ltd., has made reductions in the prices of its water-heating appliances.

Coloured Gas-discharge Lighting

The very wide range of application of discharge lighting was made evident by a demonstration at Magnet House last week of a representative selection of lamps of this type which are supplied as standard commercial products by the General Electric Co., Ltd. The scope and particular features of the different types of lamp now available are perhaps not fully appreciated. For instance, convenience is much enhanced by flexibility, since the shape of the tubes is not limited, while many attractive shades of colour are now obtainable for advertising, floodlighting or decoration, besides light of special qualities for colour matching and electro-medical purposes. This type of lamp also has considerable application for street and industrial illumination. The G.E.C. claims that by paying particular attention to the practical aspects of each case it is able to offer a range suitable for most requirements with an appropriate range of fittings specially designed for them. Floodlighting tubes are available in five different colours, and not only are the colours themselves exceptionally powerful but combination tints and shadow effects are most pronounced with red, green, and the recently added dark blue.

A display of neon signs at the Packing Exhibition held last week at Dorland Hall.

Neon Signs at the Packing Exhibition

At the Packing Exhibition held last week at Dorland Hall, Regent Street, W.1, the Trafalgar Advertising Co., Ltd., exhibited signs in various new colours designed to give a more artistic effect than the crude blues and reds hitherto in use. Actually, twenty-six different shades of illuminated tubing ranging from pure white to red and deep blue were displayed. Above the actual stand, an outline of London was shown in blue, green, uranium and chrome, while the reproduction of the flashing signs at Trafalgar Square, including the large clock and a midget electric news sign, was actually working from motor-driven mercury switches. The model of Big Ben was also synchronised. The policy of the company is to install signs that blend with the surroundings by utilising new shades.

E.D.A. (Mid-East England Area)

The E.D.A. Mid-East England Area Executive Committee visited Harrogate on June 6th. At a luncheon held at the Grand Hotel, a civic welcome was extended to the visitors by the Mayor, Councillor J. H. Newsome. Other guests included: the chairman of the Harrogate Electricity Committee (Councillor E. J. Wheater) the vice-chairman (Councillor C. E. Morris), the chairman of the Finance Committee (Alderman H. Bolland), the chairman of the Ripon Electricity Committee (Councillor F. Hargraves), the borough electrical engineer of Ripon (Mr. P. H. Molyneux), the chairman of the Bradford Electricity Committee (Alderman J. W. Longley), and the Mayor of Ripon (Councillor Richard Thorpe.) The speakers at the luncheon were Mr. T. Roles, the Mayor of Harrogate, Mr. S. E. Fedden, the Mayor of Ripon and Councillor Hargraves. After lunch the company inspected the new sun walk and sun parlour in the Valley Gardens under the guidance of the Harrogate Parks Superintendent, Mr. Besant, and the borough electrical engineer, Mr. McLean, and were later entertained to tea by the Harrogate Electricity Committee. The day's proceedings were brought to a close by a tour of inspection of the royal baths.

A Water-heating Display

The accompanying illustration shows a water-heating display which has recently been arranged at the showrooms of Notting-

A Hotpoint immersion heater display

ham Corporation Electricity Department. It will be seen that the immersion heaters, manufactured by the Hotpoint Electric Appliance Co., Ltd., make an effective display.

The Exide Convention

The record number of 750 delegates and guests attended the annual Exide Battery Convention held by the Chloride Electrical Storage Co., Ltd., at Scarborough from June 12th to 14th, among them being many overseas representatives. The morning business sessions were devoted to discussions and the reading of papers, the convention being opened with an address by Mr. D. P. Dunne, managing director of the company and chairman of the Convention. On Wednesday the Mayor of Scarborough and other guests attended the official reception and banquet at the Olympia ballroom, which was followed by a cabaret entertainment and dancing. The business proceedings were relieved by a number of social and other functions, among them being the Exide golf challenge cup competition and a four ball golf competition played on the Scarborough South Cliff golf course, Deepdale, a motor coach tour and tea at Ravenscar at the invitation of the Mayor and Corporation, and a coastal trip by steamer to Flamborough Head at the invitation of the company.

Works Visits

A party of over 100 members of the Hampshire Sub-section of the I.E.E. (Southampton and Portsmouth) were the guests of the G.E.C. at the new Osram Lamp Factory No. 7 and the glass works, on June 6th. Under the leadership of Professor Aspinall Parr (Southampton College of Technology) the party was welcomed by Mr. C. Wilson (director) at the Rest Hotel, Kenton, and after lunch spent an instructive afternoon at the Research Laboratories, under the personal guidance of Mr. C. C. Paterson.

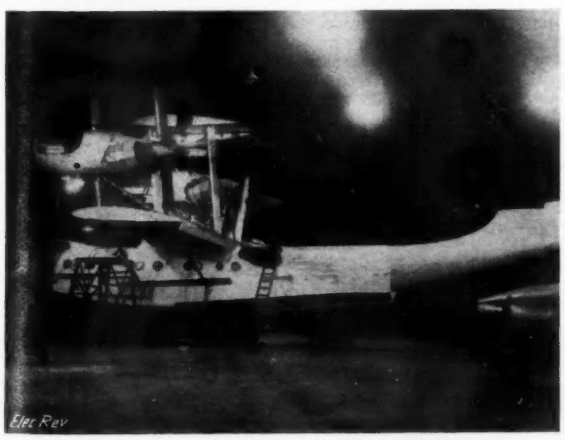
On June 7th a large and representative gathering of the British Industrial Purchasing Officers' Association, which is composed of various buyers from the leading industrial undertakings of the country, were entertained by the G.E.C. at the Clarendon Restaurant, Hammersmith, and later visited the Osram Lamp and Glass Works at Wembley. The visitors were welcomed by Mr. C. Wilson and Mr. T. Heather (sales manager).

Filming the Grid

A very fully and effectively illustrated pamphlet entitled "Power and Electricity" has been issued by the Electrical Development Association. It is printed in black and blue and tells the story of the work of the Central Electricity Board; and it describes the manufacture and construction of the national system of main distribution lines. Pylons, power stations, transforming and switching stations, the processes involved in the production of lines, cables and insulators, control rooms, and other features of interest are photographically shown. The booklet (No. 1222) is issued in the first instance as an introduction to the films "Power" and "Electricity" produced by British Instructional Films, Ltd., on behalf of the Central Board. Copies are also being circulated to schools and other educational bodies.

Aeroplane Factory Lighting

The efficient lighting of an area under one roof of some 93,000 sq. ft. in a factory where aeroplanes and flying boats in various stages of construction have to be illuminated with artificial lighting presents an unusual problem. When dealing with a total lighting load of 246 kW under one roof, considerable thought and study has to be given to the design and



The lighting of the Blackburn Aeroplane Co.'s works

layout of the wiring installation. The installation at the works of the Blackburn Aeroplane Co., Brough, East Yorks, is supplied on the three-phase, four-wire system and the lighting is balanced between the phases. The whole of the mains, sub-mains, and circuit wires and cables were manufactured by W. T. Henley's Telegraph Works Co., Ltd., and the installation was carried out by Messrs. Green & Smith, Ltd., Albert Works, Meadow Lane, Leeds. Due to the long runs necessitated, it was decided to use paper-insulated, lead-covered and single-wire-armoured cables left bright for the mains between the main switchboard and main fuseboards and between the latter and the sub main fuseboards, the circuit wiring from the latter to the lampholders being carried out in v.i.r. 600-megohm Association grade cables in heavy gauge screwed welded conduit. Our illustration shows a "Perth" flying boat in course of construction in the erecting sheds at the Blackburn Works; the photograph was taken by the lighting obtained from ten 1,500-W and four 1,000-W lamps and Benjamin reflector units, fixed in the same positions as for the permanent installation, which was carried out at a later date. In the permanent installation fifty-four 1,500-W and fifty-four 1,000-W lamps and reflector units were installed. In addition to these 108 lighting units, there are twenty 1,500-W lighting units, fourteen above and fourteen below a balcony, and an office gallery with a total area of 21,000 sq. ft., the 108 lighting units dealing with an area of 78,000 sq. ft.

A Useful Van

The accompanying illustration shows a van which, owing to its design, has proved very useful to the Tynemouth Cor-

A Commer van in use by the Tynemouth Electricity Department

poration Electricity Department. The van carries 1¼ tons and has a specially strong oak floor to enable it to carry heavy weights. A point of interest is that the back part of the roof is arranged with flaps so that it can go under a crane for lifting in heavy weights. Mr. C. Turnbull, borough electrical engineer, has also found the van an excellent advertising medium, and on its sides appear telling slogans.

The Levant Fair

The Federation of British Industries reports that the British exhibitors at the Levant Fair at Tel-Aviv, which closed on June 4th, are well satisfied with the volume of orders which have either been booked or are still in process of negotiation. Largely increased business is reported in electrical and general machinery.

Advertisement Correction

Messrs. William McGeoch & Co., Ltd., ask us to point out that their "Warwick" fuse units advertised in our issue of June 1st have a capacity of 5/15 A.

New Municipal Showrooms

The Dundee Corporation on June 7th decided to remit back a proposal of the Electricity Committee to establish a showroom and a scheme for the hire-purchase of electrical appliances. This decision followed the reading of a letter from the local branch of the Electrical Contractors' Association, stating that when a deputation met the Convener of the Committee and the borough electrical engineer it was arranged that the Electricity Department would confine the hiring of electrical appliances to cookers, wash-boilers and self-contained water heaters. According to the minute, they were to recommend also the hiring of immersion heaters and radiators. Members of the Association felt that it would be a distinct hardship on them if the Department was to hire appliances other than those agreed to. Moving the approval of the recommendation, the convener said the Electricity Committee did not want to trouble with the smaller appliances. The object was to increase the sale of electricity and the wiring was to be done by the contractors themselves.

The Inverness Town Council has decided to rent premises in High Street for three years for use as an electricity showroom.

The Workington Town Council has approved plans for electricity showrooms and offices estimated to cost £10,000.

The Middlesbrough Town Council is to erect new electricity showrooms in Italy Street and Washington Street, Middlesbrough.

Local Exhibitions

An exhibition held from June 4th to June 8th, at the Mechanics' Institute, Bradford, by the Electric Lamp Manufacturers' Association in co-operation with the Bradford Elec-

tricity Department, included lectures and demonstrations which were held on four evenings. Each lecture was of a specialised character. Monday's was for electrical contractors, Tuesday's for shopkeepers generally, Wednesday's for householders, and Thursday's for architects and builders. Attendances totalled about 350. E.L.M.A. was responsible for a number of striking exhibits illustrative of special feature lighting, including shop-window and facia lighting and signs, hotel and cinema lighting, the architectural application of lighting and domestic lighting. The Corporation's contribution included a comprehensive range of exhibits illustrating the use of electricity for domestic purposes.

On June 7th representatives of seven electrical associations visited the Industries Exhibition of South Wales and Monmouthshire at the Greyfriars Hall, Cardiff, and were officially welcomed by Councillor G. Harris, of Tredegar, a member of the executive of the Industrial Development Council. In proposing a vote of thanks to the Council, Mr. C. T. Allan (assistant manager of the South Wales Electrical Power Co.) expressed the hope that next year the number of exhibitors would be doubled, and also referred to the fact that electricity had greatly encouraged the smaller industries in the district. He was seconded by Mrs. S. B. Haslam (chairman of the Cardiff branch of the E.A.W.) and by Mr. C. G. Morley New (Cardiff city electrical engineer.) Among the chief exhibitors are the South Wales Electrical Power Co., and the Cardiff Corporation Electricity Department, who have arranged a joint stand.

The Heating of a Historical Building

Shibden Hall, Halifax, a historical building which has recently been opened to the public, has been renovated, and "Maxheat" oval tubes, made by the Wardle Engineering Co.,

Tubular heaters in Shibden Hall, Halifax

Ltd., have been installed for heating the building. There is approximately 200 ft. of tubing, loaded at 60 W per ft., to give a temperature of 40/45 deg. when the outside temperature is 32 deg. The whole installation is controlled by one thermostat in the main hall, this thermostat operating a contactor situated in the cellar. The work was carried out to the order of the Halifax Corporation Electricity Department. The accompanying illustration shows the main hall, and the tubular heaters can be seen below the staircase.

Trade Announcements

A northern branch has been opened by Messrs. Michael Black, Ltd., of Glasgow, at 30/32, Chapel Street, Aberdeen, where a comprehensive stock of radio and electrical goods will be maintained. The new branch will be under the control of Mr. R. Dalgleish.

Messrs. W. T. Henley's Telegraph Works Co., Ltd., have arranged to carry a stock of rubber wires and cables, flexible cords, jointing materials and distribution accessories at their Contract Department depôt, 152, Brook Street, Colchester (telephone: Colchester 3440).

Messrs. Baxter & Caunter, Ltd., have recently opened a depôt at 4, Carnford Square, Knightrider Street, Maidstone (telephone: Maidstone 2447), under the management of Mr. H. R. Beale.

A Sub-station Exhibit

The Better Lines Co. is exhibiting at its offices at Mile Oak, on the Watling Street, near Tamworth, its "Twenty-five" unit sub-station for overhead line systems and interconnected underground cables.

"Northmet" Publicity

The North Metropolitan Electric Power Supply Co. has issued an attractive booklet entitled "Electricity in the Home," 137,500 copies of which it is distributing throughout its area. The pamphlet contains a number of illustrations showing the uses to which electricity can be applied in the various parts of the home, and describes the company's convenient payment system.

The New Gillingham Showrooms

The new showrooms and sub-station of the Gillingham Corporation Electricity Department at the junction of Green Street and Gardiner Street were formally inaugurated by the Mayor, Ald. S. O. Summers, on June 9th. The new building has an elevation of 40 ft. and the design is dignified and pleasing. The main entrance opens into a spacious oak-panelled showroom, in which is displayed a wide variety of electrical appliances. The panelling to the left and right forms a background for four large display windows. The first floor has been laid out as administration offices, while the major portion of the second floor is taken up by a demonstration room, where accommodation for 100 persons is provided. Lectures and demonstrations will be arranged from time to time. The whole building is electrically heated, tubular heaters being used except in the showroom, where various types of radiators will provide the necessary warmth. The equipment is thermostatically controlled. The basement consists of two strong rooms of fireproof design for the safety of documents and records, and there are also two store rooms for the accommodation of stock. The sub-station installed at the new showrooms is of modern design and houses transformers and h.p. and l.p. switchgear. It has been erected to cope with the ever-increasing demands on the distribution system in the business area. The floors are served by an electric lift, installed by Messrs. Marryat & Scott, and the apparatus in the showrooms was supplied by the Revo Electric Co., Ltd., Belling & Co., Frigidaire, Ltd., Berry's Electric, Ltd., and Aidas Electric, Ltd. The new showrooms have been erected under the supervision of Mr. H. Hall, borough electrical engineer.

Prices of Materials

Messrs. Edward Till & Co., report, June 13th: India-rubber, Para fine, no change.

Messrs. F. Smith & Co. report, June 13th: Copper (electrolytic) bars, £36 10s. 15s. inc. Ditto, ditto, wire rods, no change. Ditto, ditto, h.c. wire, $7\frac{5}{8}$d., $\frac{1}{8}$d. inc. Silicium bronze wire, $8\frac{1}{4}$d., $\frac{1}{8}$d. inc.

Messrs. James & Shakespeare report, June 13th; Copper bars (best selected), sheet and rod, no change. Copper (electrolytic) sheets £36 to £36 5s., 7s. 6d. to 10s. inc. English pig lead, £12 15s., 5s. inc.

Social Events

The annual golf match between the directors and senior members of the staffs of Ferranti, Ltd., and Metropolitan-Vickers Electrical Co., Ltd., was held on June 8th, at Prestbury. Teams of ten a side contested in five four-ball matches, and the Ferranti team, by winning four matches to one, gave their opponents the pleasure of footing the bill for the supper after the contest.

The annual walk and outing of Callender's Athletic and Social Club was held on June 9th in competition for the Chas. Pipkin cup, over a course of ten miles from Taplow to Marlow. The winner Mr. J. H. Peters (Contracts) completed the course in 1 hr. 35 min. 5 sec. The team race was won by the Hamilton House team. A large party of visitors went to Windsor by train and thence to Marlow by boat where tea was arranged at the "Compleat Angler," and prizes were presented by Mr. Tom Callender. Among those present were Messrs. T. Petersen and R. Petersen, Mr. and Mrs. Tom Callender, Mr. C. Pipkin, Miss Pipkin, Messrs. H. Foulds, W. G. Hendrey, W. Lang, J. Urmston, H. B. Smith, Duncan Foulds, Mr. and Mrs. Andrews, and Messrs. F. B. Collard and E. M. Malek.

A Prize-winning Tableau

The Kettering Urban District Council Electricity Department's entry in the trade section of a parade organised on behalf of the Kettering and District General Hospital on June 2nd was awarded second prize. As our picture shows, the tableau consisted of a large-scale model cooker resting on a hemisphere painted to represent part of the world, and two

An electrical tableau at Kettering

pylons, symbolic of electricity spreading to all parts, carried a cloud bearing the words "On Top of the World." At the rear was an actual cooker, the prototype of the large model. The display was mounted on one of the Department's electric vehicles. A convertor driven by the battery supplied current to an amplifier feeding a loud speaker, so that music could be

played and announcements made from the driver's cab throughout the procession. Behind the vehicle was a large-scale aluminium electric kettle, six feet in diameter. This had rubber-tyred wheels in the feet and no base, so that a man inside was able to walk on the road and push the kettle along.

German Radio Imports and Exports

There has been an increase in the imports of foreign radio receiving sets and material into Germany this year. The official returns for the three months ended with March last show a value of £205,310, as compared with £125,385 in the corresponding quarter a year ago (£1=RM.13). On the other hand, there was a decline during the same period in the exports of similar material from Germany—from £630,460 to £194,080.

Malayan Electrical Imports

Imports of electrical goods and apparatus into Malaya during the first quarter of the current year represented a total value of £82,667, as compared with £65,727 during the corresponding period of 1933. The relative values of exports were £10,673 and £7,323.

New Catalogues and Lists

Hart Accumulator Co., Ltd., Stratford, E.15.—A price list of "Hart" cells in glass boxes with sealed lids.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.—A booklet on electrical soil heating.

Hugh J. Scott & Co., Ltd., Volt Works, Ravenhill Avenue, Belfast.—A list of Scott motors.

Julius Sax & Co., Ltd., 27, Lower Mall, Hammersmith, W.6.—A 60-page catalogue of electrical accessories.

R. Cadisch & Sons, Red Lion Square, London, W.C.1.—A 144-page accessory catalogue.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—A leaflet on portable speech amplifying equipment, also an 84-page street-lighting equipment catalogue containing full technical information.

Croydon Engineering Co., Ltd., Gloucester Road, Croydon.—A catalogue of fractional h.p. motors.

S. Wolf & Co., Ltd., 115, Southwark Street, S.E.1.—A booklet on electric tools called "How Salesmen can Increase their Turnover."

Schall & Son, Ltd., 75, New Cavendish Street, W.1.—A pamphlet on the "Schall" shockproof X-ray unit.

Wright (Electric Power Specialities), Ltd., Century Works, Halifax.—A pocket price card of small and medium sized a.c. and d.c. motors.

Estler Brothers, Ltd., South Molton Road, Victoria Docks, E.16.—A catalogue of modern traction equipment.

Bankruptcy Proceedings

F. Price, 9, Gold Street, Cardiff, lately trading in co-partnership at 15, Working Street, Cardiff, as Fred Price, Tarver & Co., electrical engineers. (Separate application.)—This debtor applied for his discharge on June 6th, at Cardiff. The representative of the debtor said he was aware of his position in 1927, but continued to trade for nine months and thought trade would improve. After debtor had been closely questioned as to his financial position, the judge granted the discharge subject to a suspension for twelve months.

J. Webster, 65, Moss Lane, Orrell Park, and at Aintree, Liverpool, electrical and radio dealer.—At the public examination of this debtor held on June 5th at Liverpool it was stated that the unsecured liabilities amounted to £920, and there was a deficiency of £460. From 1923 to 1926 debtor traded in partnership with his brother, and afterwards carried on business on his own account. In 1931 he executed a deed of assignment, and at that time his deficiency amounted to £530. With assistance from his parents, debtor paid his creditors a composition of 10s. in the £. He continued trading, and in 1932 the business showed a profit of £349. In the following year, however, a loss of £96 was sustained, which debtor attributed to manufacturers over-producing and so causing a drop in the prices of wireless sets. He was, therefore, compelled to sell his stock at much reduced prices. In 1932 he borrowed £250 to use in the business, and in September last year he obtained another loan of £300. The hearing was concluded.

E. S. Mellor, 15, Cole Street, Scunthorpe, electrical engineer.—The public examination herein was held at Great Grimsby on June 7th. The statement of affairs showed liabilities of £390 and a deficiency of £287. It was stated that in 1924 debtor entered into partnership with two others, and in 1929 the business was transferred to a limited company. That concern, however, was wound up in 1931. In June last year debtor recommenced trading in partnership with another at the above address, each partner contributing £10. In the following September the partner retired, receiving nothing for his interest. The failure was attributed to lack of capital and bad trade. The examination was adjourned.

A. G. Overton, 75a, Pasture Street, Great Grimsby, lately Holton-le-Clay, Lincs, electrical engineer.—The public examination was held at Great Grimsby on June 7th. In reply to questions the debtor said that he commenced business on his own account in August last year with a small capital. He had since borrowed money to enable him to continue trading, and he attributed his failure to lack of capital and inability to collect book debts. His statement of affairs showed gross liabilities of £178, of which £170 was expected to rank for dividend, and there was a deficiency of £116. The examination was adjourned.

A. Leach, radio dealer, 4, Market Street, Otley.—First meeting June 18th at 24, Bond Street, Leeds. Public examination July 10th at the County Court House, Leeds.

C. E. Pittman, electrical contractor and wireless dealer, 49, Birchanger Road, South Norwood, S.E., and 12, Station Road, West Croydon.—Trustee, Mr. C. R. Waterer, 29, Russell Square, W.C., Official Receiver, released May 7th.

H. A. Mayhew, electrical contracting engineer, 96, London Road, Apsley, and 30, Elmer Gardens, Edgware.—Trustee, Mr. J. L. Poland, 29, Russell Square, W.C., Official Receiver, released May 17th.

H. Parker, wireless dealer, 10, Stratford Street, Nuneaton.—First and final dividend of 1s. 8½d. in the £, payable June 11th at 9-11, High Street, Coventry.

C. E. Moore (C. E. Moore & Co.), wireless engineer, 35, High Street, St. Neots.—Last day for receiving proofs for dividend June 22nd. Trustee, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.

F. W. Chattaway and **J. A. London** (Spa Electric & Radio Co.), 1, Church Walk, Leamington Spa.—Last day for receiving proofs for dividend June 23rd. Trustee, Mr. C. J. Band, 9-11, High Street, Coventry, Official Receiver.

Company Liquidations

Bergmann Electric Co., Ltd.—Winding up voluntarily. Liquidator, Mr. C. H. Busch, 131, Victoria Street, S.W.

Hawkers, Ltd.—Meeting July 12th at 45, Newhall Street, Birmingham, to receive an account of the winding-up by the liquidator, Mr. H. B. T. Wilde.

Pewsey Electric Lighting Co., Ltd.—Particulars of claims by June 20th to the liquidator, Mr. A. J. Phillips, Victoria House, Pewsey.

Private Arrangement

W. H. Bentley Humphriss, trading as the "Kelvin Electric Co.," City Arcade, Hanley, Stoke-on-Trent, electrical and radio engineer.—A meeting of the principal creditors was held recently at Hanley when a statement of affairs was submitted which showed liabilities of £1,042 and net assets of £870, leaving a deficiency of £172. It was decided that the matter should be dealt with under a deed of assignment to Mr. P. S. Booth, accountant and auditor, 2, Bixteth Street, Liverpool, as trustee, together with a committee of the principal creditors. It was stated that the debtor would consult his relatives and friends with a view to making an offer. In the meantime the business would be continued.

Fifty Years of Instrument Making

THE business of Messrs. Nalder Bros. & Thompson, Ltd., of Lane Works, Dalston, N.E. was founded just fifty years ago, that is in 1884, by the late Mr. Francis H. Nalder and his brother, Mr. H. Nalder.

It began as Nalder Bros. at Westminster and had a small works at Brentford where the manufacture of electrical testing instruments and physical apparatus was carried on. Two years later, Mr. C. W. S. Crawley joined the partnership, and, with the growth of the business, the works were removed to Westminster in 1887, operations being carried on under the name of Nalder Bros. & Co. Mr. Alfred Soames then joined the firm which, again owing to the rapid increase of business, was moved in 1890 to Red Lion Street, Clerkenwell.

The extension of the ammeter and voltmeter branch was departmentalised and by 1896 it had so grown that it was decided to divide the business. Mr. F. H. Nalder, whilst remaining a partner in the original firm, purchased the goodwill and plant of the ammeter, voltmeter and switchboard department and was joined in that enterprise by Mr. E. Thompson, the firm being carried on under the name of Nalder Bros. & Thompson, at 34, Queen Street, E.C. On the other hand, the testing, physical and other instrument work was subsequently purchased by Messrs. Muirhead & Co., of Elmers End, Beckenham, and, on the sale of that business in 1897, Mr. Nalder's direct interest in that firm ceased. Further large increase in the business led to its being converted into a private limited company in 1899, and additional works were taken at Kingsland Green, Dalston.

In 1913, the Queen Street works having become quite inadequate to cope with the business, additional works were acquired at 97a, Dalston Lane (close to the Kingsland Green works). These are equipped for efficient testing during manufacture of all apparatus and instruments used on switchboards. Work was commenced here in March, 1914, and all manufacturing work was then removed from 34, Queen Street. A redistribution of work was made as regards Kingsland Green, which factory is still used to produce the parts. All matters of administration are dealt with from the Dalston Lane works, which have now become the registered offices. A new factory alongside these offices is under construction to take the place of the Kingsland Green works, so that in future the whole business will be virtually carried on under one roof. This up-to-date factory will be considerably larger than the one it is replacing.

The technical developments during the period of fifty years have been continuous, but, in addition to well-known products, we may mention the introduction of an entirely new line of circuit-breakers from house-service types to those of large capacity. In connection with the manufacture of protective relays, in which the company has specialised, it is of interest to note that these relays were incorporated in the protective schemes of the grid system exclusively in several areas.

Electricity Supply

Lighting, Domestic, Power

Allendale (Northumberland).—VOTE ON SUPPLY.—Mr. H. Lennox, of the North-Eastern Electric Supply Co., Ltd., has drawn up a scheme costing £980 for supplying electricity to Allendale. A poll is to be taken within a few weeks to ascertain the number of inhabitants in favour of a supply.

Alston (Cumberland).—SUPPLY DEVELOPMENTS.—The Mid-Cumberland Electricity Co. is to supply electricity to Alston, Nenthead, and Garrigill. The Alston Rural District Council has agreed to offer no opposition.

Altcar.—SPECIAL ORDER.—Application has been made by the Lancashire Electric Power Co. for permission to supply electricity to Altcar and Downholland.

Ashford (Kent).—BULK SUPPLIES.—The Electricity Committee has reported to the Urban District Council that the electrical engineer is arranging, on terms, to make tappings on the Folkestone line near Smeeth and Sellindge to enable the Kent Power Co. to supply Smeeth, Brabourne, Lees, Aldington, and Sellindge, and that it also required a tapping at Bromley Green to supply Hamstreet and Warehorne. The Weald Electricity Supply Co. proposes to supply Woodchurch and possibly Appledore, and has asked whether the Council would give a bulk supply at Shadoxhurst. The Council has agreed that prices shall be quoted to the company.

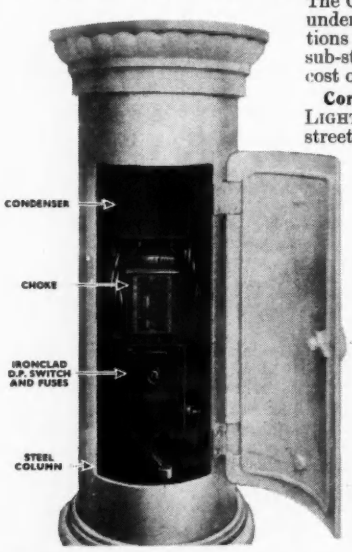
Australia.—CONTROL LEGISLATION IN N.S.W.—The New South Wales Government is about to introduce legislation to control the electrical trade. The object is to prevent serious accidents caused by the use of dangerous electrical appliances. Provision will be made for stricter supervision of electrical apparatus and of the installation of fittings.

Barrow-in-Furness.—FRINGE ORDER.—The Electricity Committee is to apply for a Fringe Order for the purpose of providing a supply to Ellers Mill, Ulverston.

Bolton.—LOAN.—The Corporation is seeking sanction to borrow £50,000 for electricity mains extensions.

Bridge of Allan (Stirlingshire).—SCHEME TO PROCEED.—The Sunnylaw district of the well-known Stirlingshire health resort of Bridge of Allan has decided by plebiscite to have an electricity supply by overhead cables, and the Scottish Midlands Supply Co. has been instructed to proceed with the scheme, which had been held up owing to the Town Council's objection to overhead lines.

Cardiff.—NEW PLANT.—The Electricity Committee is to increase the capacity of Ninian Park Road depôt by installing a larger transformer and laying a feeder at a cost of £689. The Committee has decided to undertake switchgear alterations at the Ninian Park Road sub-station at an estimated cost of £450.



The base of a steel pole with compartment for housing choke coil, condenser, switchgear, &c., for "Osira" lamps in street-lighting installations

Corby.—IMPROVED STREET LIGHTING.—A new electric street-lighting system is being devised to replace the existing one. The town's phenomenal growth due to the erection of Messrs. Stewart & Lloyds' steelworks render this necessary.

Coventry.—LOAN.—The City Council has decided to make application to the Electricity Commissioners for sanction to a loan of £86,590 for the laying of main transmission cables and the provision of sub-station equipment.

Crewe.—LOAN.—The Town Council has applied for a loan of £5,000 for mains, &c.

Darwen.—ALTERNATIVE CHARGES.—An alternative charge is to become optional for private consumers. The consumer will pay an annual amount equal to 25 per cent. of the first £10 of the rateable value; for the next £40, 15 per cent., and the "unit" charge will be ¾d. for the first 200 kWh, and all in excess of ½d. per kWh in winter and ⅜d. in the summer.

Eccles.—HIRING OF COOKERS.—At a recent Electricity Committee meeting the engineer reported that, since the bringing into operation of the scheme for the hiring of new cookers, there had been a number of applications by persons who had on hire old-pattern cookers, for the replacement of these by the new type. He said that there were at present 110 of the old cookers on hire, and suggested that, as these had been in use for periods varying from three to eight years, they should be offered on rentals based on the annual cost for maintenance and repairs. The suggestion was adopted.

Formby.—SUPPLY FROM THE GRID.—On July 15th the electricity undertaking will rely for its supply of electrical energy on the grid, drawing its requirements from the Lancashire Electric Power Co. Hitherto the Council's requirements have been met by the London, Midland & Scottish Railway Company's supply.

French Indo-China.—ELECTRICITY SUPPLY PROGRESS.—In a recent issue of the *Bulletin* of the Union Internationale des Producteurs et Distributeurs d'Energie Electrique, some particulars are given of the progress of electricity supply in French Indo-China during 1932. Taking into account only the plants operated by private undertakings for the public supply of power, the total installed capacity at the end of the year mentioned was 49,292 kW. Up to the end of 1930, during which year the output of power amounted to 72,797,000 kWh, there was a steady rise, but since then, owing to the industrial depression, the production has declined; in 1932 it was only 64,295,000 kWh.

Germany.—DROUGHT AFFECTS SUPPLY.—At Stein, near Nürnberg, a disused steam turbine power station has had to be reopened as, owing to the drought, the three Franconian hydro-electric stations are no longer able to cope with the demand. A similar state of affairs exists in part of Bavaria, where Alpine streams have failed to give a sufficient supply of water to hydro-electric stations.

VILLAGE ELECTRIFICATION EXPERIMENT.—The village of Saulwitz, near Breslau, has been chosen by the Silesian Electrical Company for an experiment designed to find out how much it costs the German farmer completely to electrify his farm. Every farm in the village is being provided with electric light, electric cokers, potato steamers and hot-water plants. The cost is being borne by the company and the farmers will have to pay only for the electricity which they consume.—*Reuter* (Berlin).

Glasgow.—MAINS EXTENSIONS.—The Electricity Committee has agreed that distributing mains shall be laid at a cost of £17,158.

WIRING COUNCIL HOUSES.—The director has reported to the Housing Committee that there are 2,230 houses erected by the Corporation which are not provided with electric lighting, and that the cost of surface wiring, &c., would be £5 per house, and of cables, &c., £3 10s. per house. A special sub-committee appointed to consider the practicability of installing electric lighting in all houses erected by the Corporation agreed that, in the event of 50 per cent. of the tenants in a block indicating their willingness to pay the cost of wiring, &c., the Corporation shall install the main cables, &c., to the block.

DALMARNOCK TO SUPPLY PORT DUNDAS AREA.—The general manager, having reported to the Electricity Committee the receipt of an application from the manager for Scotland of the Central Electricity Board, asking that, during the period of the summer light load, and in order to effect some economy, the Corporation should supply its Port Dundas area direct from Dalmarnock, the Committee agreed that the request be acceded to, subject to suitable safeguards as regards the Corporation's right to discontinue the arrangement when it so desires and to require the resumption of the grid supply at any time in cases of emergency.

Gravesend.—LOAN.—The Electricity Committee has received sanction to borrow £20,000 for mains and services.

Guildford.—SUPPLY TO CRANLEIGH.—The Town Council is to extend its mains to give a supply of electricity to a new housing estate at Restwell Avenue, Cranleigh.

Italy.—ELECTRICITY PRODUCTION.—The total production of electricity during 1933 amounted to about 12 milliards of kWh, or about one milliard more than in 1932. During February, 1934, the output reached 872 million kWh and the aggregate for the first three months of the year was 1,841 million kWh, or about 8.4 per cent. more than in the corresponding period of 1933.

NEW OVERHEAD LINE.—La Societa Ligure Piemontese di Elettricita, of Turin, has lately been authorised to proceed with the erection of a 130,000-V power transmission line between Lemie and Mortara, a distance of about 70 miles.

Kirkcudbright.—CHANGE-OVER OF SYSTEM.—The County Council of the Stewartry of Kirkcudbright intends to apply for permission to alter the system and pressure of the supplies hitherto given at the following places: Castle-Douglas and Dalry, from 100 V d.c.; and Dalbeattie, Gatehouse, and Trynholm, from 200 V d.c. to 230 V and 400 V a.c. at a frequency of 50 cycles.

Liverpool.—SUPPLY EXTENSIONS.—At its June meeting the Liverpool City Council considered a series of recommendations for obtaining Special Orders to supply the districts of Melling, Downholland and Simonswood. The city electrical engineer has reported that in Melling over £7,000 has already been expended on h.p. and l.p. lines and sub-stations, and consequently it is desirable that powers should be obtained. As regards Downholland, the West Lancashire Council has requested the co-operation of the Corporation to extend the area of supply. In this case it will be necessary to erect a 6,000-V line at a cost of £3,100, provide l.p. distributing lines

at a cost of £2,600, and sub-stations at a cost of £850. The expenditure in respect of Simonswood would be:—Overhead lines, £1,950; l.p. lines, £1,600; and sub-stations, £400.

London.—LEWISHAM.—The South Metropolitan Electric Light & Power Co., Ltd., is to extend cables in various streets in the district.

Maidstone.—REDUCED CHARGES.—The Town Council has adopted the following reduced scale of charges:—Two-part tariff, from 3s. 4d. per quarter for each 60-W lamp or its equivalent and 1d. per kWh between October 1st and March 31st, and ¾d. per kWh between April 1st and September 30th, to an all-the-year-round "unit" charge of ¾d. For consumers using more than 10,000 kWh per annum and less than 25,000, the quarterly charge will be 3s. 2d. per 60-W lamp, and for consumers using more than 25,000 kWh per annum, it will be 3s. The charge for heating and cooking energy is reduced from 1d. to ¾d. per kWh in the winter quarters. The additional charges in the outlying districts are reduced.

LOAN.—The Council has received sanction to a loan of £5,205 for plant for two sub-stations.

Manchester.—A YEAR'S PROGRESS.—The annual report of the electricity undertaking shows a total income of £1,875,809 to March 31st, 1934 (£1,890,722 during the previous financial year), and a working expenditure of £1,086,834 (£1,102,320), leaving a net profit of £199,936 (£161,129). The sales of electricity reached 436,600,000 kWh, an increase of 26,900,000 kWh over the previous month, but the revenue showed a decrease of 1.1 per cent. The increase in the number of consumers was 14,899, bringing the number connected up to 103,059. A net increase of 62 hired motors has been recorded, and the change in system of supply has necessitated the replacement of 1,120 motors. The progress in the use of electric cookers continues actively, 1,621 additional cookers having been hired. As a result of the facilities for the hire of self-contained electric water-heaters, 130 heaters of various types have been installed. A further 200 wash-boilers have also been hired out.

NEW PLANT.—The Electricity Committee has obtained sanction to borrow £12,750 for the erection of a cooling tower and £50,000 for boiler plant.

CHANGE-OVER.—The Electricity Committee has authorised the engineer to make arrangements for the change-over from d.c. to a.c. in certain areas.

TWO-PART TARIFF METERS.—The Electricity Committee has decided to install two-part tariff prepayment meters, as an experiment, in certain houses on the Brownley Green Estate.

Market Rasen.—ELECTRIC STREET LIGHTING.—By a majority of over two to one the ratepayers have voted in favour of lighting the streets of the town by electricity. The Council has accordingly passed a resolution terminating its contract with the local gas supply undertaking, and a special meeting has been called to consider a draft agreement with the electricity company. A supply of electricity is expected to be available next autumn.

Mexborough.—FLOODLIGHTING.—We illustrate on this page the floodlighting of the Montagu Hospital Nurses' Hostel, Mexborough, by eight 1,000-V G.E.C. lanterns. The installation was carried out by Mr. E. Andrews, engineer and manager of the Council's Electricity Department.

Morocco.—NEW SODIUM LIGHTING.—A Philips sodium lighting system has been installed on the 50-mile highway linking the two Moroccan ports of Casablanca and Rabat.

Newton Abbot.—POWER STATION IMPROVEMENTS.—The Electricity Committee recommends the purchase of a 15,000-kW turbo-alternator and two 100,000 lb. boilers for power station improvements which will cost £130,000.

Northern Ireland.—BELFAST.—The City Council has agreed to the proposal of the Electricity Committee to raise £146,300 to cover the cost of extending the steam boiler plant capacity at the Harbour power station.

Nuneaton.—LOAN.—A proposed supply to Arbury Hall and Ansley Road necessitates the Town Council seeking sanction to borrow £3,940.

Reading.—GRID SUPPLY.—The Town Council has approved a report from the Electricity Committee recommending the taking of a partial supply of electricity from the Central Electricity Board to augment the present generating station capacity (which will involve the shutting down of the station during the summer months). A scheme for the provision of 11,000-V switchgear equipment and buildings at an approximate cost of £29,800 was also approved, and sanction is being sought to a loan of this amount.

Reigate.—ELECTRICITY SUPPLY DEVELOPMENT.—The Town Council has approved a scheme for reorganising the electricity supply system in the borough, at an estimated cost of over £64,000.

WIRING COUNCIL HOUSES.—The Town Council has consented to forty-six of its houses at Merstham being supplied with electricity under the hire-purchase wiring scheme by the County of London Electric Supply Co., Ltd.

Ripon.—REDUCED CHARGES.—The Electricity Committee recommends that the charge be reduced from 6d. to 4d. per kWh in respect of electricity supplied to shop premises between 9 a.m. and 5 p.m. providing the consumers agree to install or pay for the installation of a time switch; electricity consumed at other times is to be charged for at the usual rate. Meter rents are to be reduced from 2s. 3d. to 1s. 6d. per quarter in the rural area, and from 1s. 6d. to 1s. in the city area.

Rotherham.—SUB-STATION.—The Electricity Committee has purchased land at Rawmarsh Hill, Parkgate, for the erection of a sub-station.

Rugby.—ELECTRICITY REPLACES GAS.—The Town Council has decided to have a portion of Church Street and Clifton Road lighted by electricity, with the conversion of forty existing gas lamps, at an estimated capital cost of £1,500.

Sheffield.—SUB-STATIONS.—The Electricity Committee is to erect sub-stations on the Frecheville Estate, at Lees Hall Road, and on the Woodthorpe Estate.

MAINS EXTENSIONS.—Sanction to borrow £13,603 for the provision of mains, etc., has been obtained, and extensions are to be carried out at a cost of £9,555.

The Montagu Hospital Nurses' Hostel, Mexborough, floodlighted

Southgate.—ELECTRICITY FOR COUNCIL HOUSES.—The Corporation reports that the North Metropolitan Electric Power Supply Co. proposes to canvass tenants of the Council's pre-war houses with a view to installing electricity.

South Shields.—LOANS.—The Electricity Committee has received sanction from the Electricity Commissioners to borrow £10,000 for mains and meters. Application is to be made to borrow a further £500 for meters.

Spalding.—MAINS EXTENSIONS.—The Urban District Council is to carry out mains extensions in the town at an estimated cost of £650.

Stewartry.—LOAN SANCTIONED.—Sanction has been obtained to a loan of £10,000 (£6,500 for consumers' apparatus, and £3,500 for wiring installations).

Swindon.—LOAN.—The Electricity Committee is seeking sanction to borrow £1,075 for a supply to the Stratton factory site.

Tamworth.—TRANSFER OF UNDERTAKING.—The Town Council has authorised the Electricity Committee to enter into negotiations with the Tamworth District Electric Supply Co., Ltd., for the transfer of the Corporation electricity undertaking.

Torquay.—CORPORATION TO SUPPLY TOTNES.—The Corporation proposes to purchase from the Electric Supply Corporation the undertaking authorised by the Totnes Electric Lighting Order, 1900, and is to apply for a Special Order to supply the area.

United States.—ST. LAWRENCE WATERWAY.—The United States Government is to reopen negotiations during the summer with the Government of Canada regarding the Great Lakes-St. Lawrence waterway. A *Times* report from Washington states that the refusal of the Senate to ratify the treaty which was concluded last year is by no means accepted as final and a revised treaty will be sought. There is now before Congress an engineer's report on the inland waterway development of the United States submitted by President Roosevelt as an introduction to the large "water use" programme he will later present. Several of the projects included in the scope of this report would be affected by and their execution is predicted upon the construction of the St. Lawrence waterway. For this reason, together with others, the conversations with Ottawa will be resumed.

Uppingham.—EXTENSIONS OF SUPPLY.—The Mid-Lincolnshire Electricity Supply Co., Ltd., has informed the Rural District Council that lines are to be erected forthwith for supplying the villages of Tixover, Bisbrooke, Glaston, Morcott, and Barrowden.

Wakefield.—LOAN.—The Electricity Committee has obtained sanction to borrow £5,000 for sub-stations and equipment.

Walsall.—LOANS.—The Electricity Committee is seeking sanction to borrow £40,000 for underground distributor mains, and £3,000 for sub-station equipment.

Whitby.—REDUCED CHARGES.—The Urban District Council has decided to reduce the commercial cooking rate for electricity from 1d. to ¾d. per kWh and the slot meter rate from 8d. to 7d.

Winchester.—LOAN.—The City Council has applied for a loan of £13,000 for meters.

Traction

Bournemouth.—TROLLEY-BUSES.—The Corporation has decided to purchase thirty-six new double-decker trolley-buses and proceed with the erection of the necessary equipment at a cost of £123,493.

Leeds.—NEW TRAMCARS.—The Finance Committee has authorised the expenditure of £43,100 on sixteen new tramcars.

London.—NO N.E. TUBE EXTENSION.—The London Passenger Transport Board announces that there is no hope of the Underground railway system being extended to north-east London for some considerable time.

Portsmouth.—REPORT ON THE TRAMWAY DEFICIT.—As a result of an investigation into a deficit of £12,133 on the Corporation tramway undertaking for the year 1933-34, a number of important recommendations have been made by a special Sub-Committee. The deficiency is attributed principally to the competition of privately owned vehicles, so to encourage regular passengers on the Corporation trams it is proposed to introduce monthly season tickets, as well as reduced return fares for workmen and term tickets for school children. Among numerous suggestions for modernising the service are proposals for the conversion of the remaining 8¼ miles of tramway track to trolley-bus operation within the next two years and for the immediate extension of the trolley-bus system from South Parade Pier, along Festing Road, Albert Road, and Bradford Road to the Guildhall and Twyford Avenue. In addition, it is proposed to apply for a Provisional Order to run trolley-buses through Northern Parade to Cosham as far as Southwick Hill, and also to re-lay the tramway track between Lake Road and New Road at an estimated cost of £1,953.

Reading.—TRANSPORT POLICY.—A report by a sub-committee dealing with the policy to be adopted by the Corporation with regard to the transport undertaking outlines the history of the tramway undertaking, and, after dealing with the four types of vehicles—tramcars, petrol buses, heavy-oil buses and trolley vehicles—says that the advantages of the trolley vehicles appear to outweigh their disadvantages. It is therefore recommended that trolley vehicles shall supersede the present tramway system, and so much of the omnibus system as it may be deemed desirable to abandon, whilst the subsidiary and occasional omnibus services at present operating are retained with such variations in routes as may be found to be necessary. It is proposed that the tramways shall be abandoned gradually. Powers to operate trolley vehicles over certain routes will be applied for, and steps will be taken to operate the Caversham-Whitley tramway route as a trolley-vehicle route. The total cost of this conversion will amount to £15,000. The total cost of the entire change-over, which is to be completed by 1941, is £197,154.

Fitting the new relay control box which is to be used in connection with the Group Telephone System. Each group of subscribers will have its control point similar to the one shown. This particular control, in Bingham Park, Sheffield, is one of the first to be completed

South Shields.—TROLLEY-BUS SCHEME.—The Town Council has adopted a £14,500 scheme prepared by Mr. E. R. L. Fitzpayne, tramway manager, for a trolley-bus service between Shields and Marsden. A Bill is to be promoted in Parliament to obtain the necessary powers.

Traffic Signals.—The Durham County Council has authorised the surveyor to prepare estimates for the provision of traffic signals at three road junctions.

The Glasgow Streets Committee is to erect "Electromatic" traffic signals at the junction of Alexandra Parade and Cumbernauld Road.

Wallsend.—TROLLEY-BUSES.—The Newcastle City Council has notified the Wallsend Town Council of its intention to promote a Parliamentary Bill to empower it to introduce a trolley-bus service from Newcastle to Wallsend, a distance of six miles. The Wallsend Council has authorised its Town Clerk to take steps to obtain any necessary amendments to the Bill.

Wolverhampton.—TROLLEY-BUSES.—The Transport Committee has given permission to the Sunbeam Motor Car Co., Ltd., and Guy Motors, Ltd., to make trials of their new trolley vehicles over portions of the Corporation trolley vehicle route.

Communications

Australia.—BASS STRAIT CABLE.—Three tenders, two British and one foreign, have been received by the Postal Department for the supply and installation of the submarine telephone cable which is to link the mainland of Australia with Tasmania. Mr. H. P. Brown, director of postal services, states that each tender contains several alternative proposals which it will take some time to examine. The cable is expected to cost about £200,000, and it is hoped to have it in operation within twelve to fifteen months.

Great Britain.—TELEPHONY.—The Postmaster-General, Sir Kingsley Wood, announced in the House of Commons last week a number of reductions in telephone charges to take effect from October 1st next. Rentals will be reduced considerably; in London for the exclusive line service the quarterly charge will be lowered from £1 12s. 6d. to £1 6s., while in the provinces (except Glasgow, Birmingham, Liverpool and Manchester, which will be charged £1 3s. instead of £1 10s.) the cost will be £1 instead of £1 7s. 6d., as formerly. Group service and business rates are to be reduced correspondingly. An alternative business rate will be introduced for small users who do not expect to make more than 144 calls per quarter. The rental involves an increased charge of 50 per cent. on the first forty-eight calls a month. It is, however, so designed that the total bill of a subscriber cannot be more than it would be on the ordinary business rate. The charge in the London area will be £1 12s. per quarter. A monthly tariff will be introduced as an alternative to the usual quarterly one, and deposits in excess of £1 will be refunded. No deposit will be required normally for new subscribers, but a non-returnable connection charge of 15s. will be made. A new service will enable subscribers to authorise persons to make trunk calls to them at their cost. A report of Sir Kingsley Wood's speech appears in our "Parliamentary News."

BROADCASTING.—It is estimated that the B.B.C.'s revenue will amount to £2,125,000 this year, including the additional £100,000 which the Post Office is handing over. Little of the increased income will be appropriated for programmes as the Corporation is committed to heavy capital expenditure during the year, including £200,000 on Droitwich, £210,000 on the Northern Ireland, Highlands and North-Eastern Section, and about £15,000 on Plymouth and North Wales.

TELEVISION COMMITTEE.—The Television Committee, under the chairmanship of Lord Selsdon, has held several meetings at which evidence has been heard, and arrangements have been made to hear further evidence. Anyone wishing to submit evidence should write to the secretary, Mr. J. Varley Roberts, Telegraph and Telephone Department, G.P.O., E.C.1.

RADIO RELAY SERVICES.—Applications by Gwalia Radio Relay Services, Ltd., and Rediffusion, Ltd., together with other applications received, for permission to operate a radio relay service in Cardiff have been referred to a sub-committee for consideration and report by the Highways Committee.

India.—BROADCASTING.—The Government of India has been offered, on loan, a broadcasting transmitter by the Marconi Company for the proposed station at Delhi, and the offer also includes the equipment of ten villages in that district, free of charge, with specially designed receivers with loud-speakers. The company has also offered to install fifteen receivers in the Peshawar district of the North-West Frontier Province, reports our Bombay Correspondent.

TELEPHONY.—It is hoped that by the end of the next year Madras will be linked by telephone with Calcutta *via* the coastal towns and seaports like Vizagapatam and Cocanada. Another important step is the laying of submarine cables across the confluence of the Ganges and the Brahmaputra. Increasing attention is being paid to the development of alternative routes. There are three routes to Bombay from Delhi, namely, *via* Agra-Bhusaval, Muttra-Rutlam, and the Ajmer-Ahmedabad. Further, to improve clarity of speech, 'phones of the carrier type are being increasingly used.

Manchuria.—TELEGRAPH AND TELEPHONE PROGRESS.—The recently formed Manchuria Telegraph & Telephone Co. has commenced work on the establishment of a network of telegraph and telephone lines in the country. A total of 1,475 miles is due for completion by the end of the present year.

Poland.—TELEPHONY.—The inauguration of the Upper Silesian automatic telephone exchange network took place at Katowitz on June 5th. Col. Kalinski, the Polish Minister of Posts and Telegraphs, made the first call over the new network to the Prime Minister at Warsaw. The system has been planned to serve the most important mining and industrial area in Poland, and consists of eleven exchanges. Direct communication is now provided between telephone subscribers up to 50 Km. apart. The actual capacity of the new network is 9,700 lines with an ultimate capacity of 20,600 lines. The telephone density of Upper Silesia has increased in four months from 5,600 subscribers to 7,800. The Telephone & General Trust has granted the Ministry a long-term investment loan of £550,000 in cash and telephone equipment in order to facilitate the construction of the new network. The manufacture of automatic exchange equipment of the Strowger pattern has been commenced at the State factory, which is now equipped on the most modern lines.

TELEPHONY.—The budget of the telegraph administration for the coming year includes provision for the laying of a direct telephone cable between Poland and Sweden.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Ashbourne.—June 19th. Derbyshire Public Assistance Committee. Electric lighting installations in the Poor Law Institution and Compton Offices. Specifications from County Architect, County Offices, Derby (deposit £2 2s. each, payable to the Derbyshire County Council); tenders to H. Wilfred Skinner, clerk to the committee, County Offices, Derby.

Australia.—MELBOURNE.—July 24th. Posts and Telegraphs Department. Enamelled insulated braided switchboard cable. (A.Y. 12396.)*

June 26th. Rectifier and motor generators. (A.Y. 12409.)*

July 23rd. State Electricity Commission of Victoria. Two 2,000-kVA three-phase oil-immersed transformers. (A.Y. 12414.)*

Bexley.—June 27th. Electricity Committee. Underground cables for twelve months ending July 31st, 1935. (See this issue.)

Blackburn.—June 29th. Electricity Department. Three sub-station kiosks, complete with e.h.p. and medium-pressure switchgear. (See this issue.)

Bristol.—June 30th. Electricity Department. CO_2 fire protective equipment. (May 25th.)

Carlisle.—June 16th. City Council. Five axial-flow pumps, with electric motors and equipments, connecting pipes and incidental work. Specifications from P. Dalton, city engineer and surveyor, 18, Fisher Street (deposit £2 2s.).

Cheadle & Gatley.—June 18th. Electricity Department. Extensions to existing 6.6-kV switchgear and 6.6-kV switchgear for the Ramillies Avenue sub-station. (June 1st.)

June 28th. Electricity Department. 6.6-kV feeder between Cheadle main station and Cheadle Road sub-station. (See this issue.)

Chichester.—June 30th. City Council. Meters, lamps, wiring supplies, joint boxes, cables, cookers, water heaters, etc. (See this issue.)

Conisborough.—June 16th. Electric lighting at Morley Place Council School. Particulars from Education Officer, County Hall, Wakefield; tenders to J. C. McGrath, clerk of the county council, County Hall, Wakefield.

Dover.—July 20th. Corporation. Complete equipment of two Scott-connected transformer chambers. (See this issue.)

Durham.—June 15th. County Council. One-way light signals at three road crossings. Specifications from W. J. Merrett, county engineer and surveyor, County Surveyor's Office, 43, Old Elvet.

Eastbourne.—June 28th. Electricity Department. Street-lighting lanterns and brackets. (See this issue.)

East Retford.—June 20th. Electricity Department. Transformers, switchgear, e.h.p. and l.p. cables. (June 8th.)

Egypt.—CAIRO.—July 12th. Ministry of the Interior. Material required for the extension of the electrical network at Mehalla el Kobra. (A.Y. 12361.)*

July 17th. Electrical equipment for the supply of power to Chebin-el-Kanater. (A.Y. 12407.)*

June 27th. Ministry of Public Works. Electrically driven machine tools and generating set. (A.Y. 12390.)*

Farnborough.—June 20th. U.D.C. Electric syren at the fire station. Particulars from Offices of the Engineer and Surveyor; tenders to J. G. Kingdon, clerk to the counsel, Town Hall.

Folkestone.—Corporation. Heating and lighting of the pavilion, East Cliff. (June 8th.)

Glasgow.—June 21st. Corporation. Electrical work at High School. Specifications, &c., from Education Offices (property department), 129, Bath Street (deposit £1 1s.); tenders to Town Clerk.

Grantown.—June 30th. Town Council. Various works, including electric lighting, at housing scheme. Schedules from T. M. Jaffrey, architect, Grantown-on-Spey (deposit £1); tenders to Town Clerk.

Haworth.—June 21st. Electricity Department. Cable, transformer, cubicle triple-pole switch and ironclad 4-pole switch. (See this issue.)

Heston and Isleworth.—June 29th. Electricity Department. 560-V standby battery. (June 8th.)

Hull.—June 25th. City Council. Electric lighting in new garage. Specifications from City Treasurer, Guildhall (£2).

Lanarkshire.—June 19th. County Council. Various works, including electric lighting, at housing scheme. Schedules from P. C. Smith, county housing and town planning engineer, Clydesdale Street, Hamilton.

Leeds.—June 16th. Wiring at Menston Mental Hospital. Particulars from W. E. H. Burton, Mental Hospital, Wakefield (deposit £2 2s.).

London.—CENTRAL ELECTRICITY BOARD.—June 28th. 132,000-V transformers and 66,000-V and low-voltage transformers. (May 25th.)

FINSBURY.—Borough Council. June 18th. Vehicle-actuated automatic traffic-control signals. Specifications from Borough Engineer and Surveyor, Town Hall Annexe, Rosebery Avenue, E.C.

H.M. OFFICE OF WORKS.—June 15th. Electrical accessories. (June 1st.)

METROPOLITAN WATER BOARD.—June 20th. Two electrically driven vertical centrifugal well pumps and two sets of electrically driven horizontal centrifugal high-lift pumps, piping, &c., at the Rye Common pumping station. Specifications from the Chief Engineer, 173, Rosebery Avenue (deposit £2 2s. with the Accountant).

Newport (Mon.).—June 23rd. Electricity Department. Electrically driven circulating water pumps, switchgear and water screening plant. (June 1st.)

New Zealand.—WELLINGTON.—Post and Telegraphs Department. July 3rd. Telephone instrument and switchboard cords. (A.Y. 12363.)*

July 4th. Telephone keys and key-mountings. (A.Y. 12366.)* Metal-cased condensers. (A.Y. 12364.)*

July 24th. 100,000 rubber insulator rings. (F.Y. 2036.)*

Northern Ireland.—LISBURN.—June 19th. Lisburn and District Hospital Committee. Alterations to district hospital, electrical installation. Particulars from S. J. Crail, clerk, Hospital Offices, Dublin Road.

BELFAST.—June 20th. Electric lighting installations in dwellings at Cherryvalley, Ravenhill Park Gardens, and Donegall Road. Particulars from Town Clerk.

Nottingham.—June 19th. Electricity Committee. General stores for twelve months. (June 1st.)

Oldham.—June 16th. Lighting installations in dwelling houses. Particulars from Borough Engineer and Surveyor, Town Hall.

Penicuik.—June 16th. Town Council. Various works, including electric lighting, of sixty "flatted" houses. Schedules from Morham and Brotchie, surveyors, 29, Hanover Street, Edinburgh; tenders to Town Clerk.

South Africa.—CAPE TOWN.—July 18th. Electricity Department. Mercury-arc rectifier equipments and d.c. switchboard. (A.Y. 12417.)*

Stockton-on-Tees.—June 16th. Education Commitee. Electric lighting fittings in schools. Specifications from and tenders to J. S. Purdey, director and secretary, Education Offices, 32, Dovecot Street.

Stranraer.—July 5th. Town Council. Various works, including electrical fittings, at fifteen blocks of houses. Specifications from A. Maclean Goudie, architect, 30, Lochryan Street (deposit £1); tenders to Town Clerk.

Tain.—June 26th. Town Council. Various works, including electric lighting, at twenty houses. Schedules from J. H. Hinton Gall & Son, architects, 13, Lombard Street, Inverness; tenders to Town Clerk.

Tamworth.—June 18th. Sewage Disposal Joint Committee. Removal of existing pumping plant and installation of two centrifugal pumps with electric motors and equipment, connecting pipes and incidental works. Specifications from Dodd & Watson, 3, Central Buildings, S.W.1 (£2 2s.).

Uruguay.—MONTEVIDEO.—July 27th. State Electricity Supply and Telephones Administration. Bare copper conductors and telephone lines. (G.Y. 13853.)*

Weymouth & Melcombe Regis.—June 15th. Electricity Department. 11,000-V overhead and underground line and l.p. overhead lines. (May 18th.)

Wolverhampton.—July 2nd. West Midlands Joint Electricity Authority. Two 5,000-kVA, 33/11,000-V transformers, e.h.p. and l.p. cables. (June 8th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Birkenhead.—Electricity Committee. Accepted. Switchgear (£75).—Ferguson, Pailin, Ltd. Electrical wiring in houses (£245).—Park Electrical Co.; (£87).—Economic Electric Co.; (£32).—L. W. Bryan; (£137).—Seymour & Co.

Cardiff.—Health Committee. Accepted. Electrical equipment for isolation hospital (£56).—Drake & Gorham, Ltd.

Electricity Committee. Accepted. Switchgear for Hayes sub-station (£1,422).—Reyrolle & Co., Ltd.

Chesterfield.—Town Council. Accepted. Transformer kiosk at Old Brampton (£158).—British Thomson-Houston Co., Ltd.

Glasgow.—Cleansing Committee. Batteries for electric vehicles (£3,615).—Tudor Accumulator Co., Ltd.

Liverpool.—Port Sanitary and Hospitals Committee. Recommended. Generating set and engine for the Walton Hospital (£1,409).—General Electric Co., Ltd.

London.—HACKNEY.—Works and Open Spaces Committee. Recommended. Eight batteries for electric vehicles (£1,073).—Britannia Batteries, Ltd.

EAST HAM.—Electricity Committee. Recommended. Bus-coupler panel (£418).—A. Reyrolle & Co., Ltd.

L.C.C.—Housing and Public Health Committee. Recommended. Electric lighting at dwellings at Southwark (£242).—A. Hawkins & Sons.

Scarborough.—Entertainments Committee. Accepted. Switchboard alterations, &c., at open air theatre (£217).—A. W. Sinclair & Sons, Ltd.

Seaham Harbour.—Durham County Education Committee. Accepted. Electrical installation at the Camden Square Intermediate Council and the Seaham Intermediate Schools (£316).—Sleigh & Wood.

Sutton Coldfield.—Electricity Committee. Accepted. Cable extensions to Canwell (£268).—General Electric Co., Ltd.

Tredegar.—Urban Council. Accepted. Transformers, switchgear, cables, &c. (£3,811).—Pirelli-General Cable Works, Ltd.

Workington.—Electricity Committee. Accepted. Two 500-kVA transformers (£1,112).—Ferranti, Ltd. Switchgear (£689).—Switchgear & Cowans, Ltd. Link boxes and feeder pillars (£99).—W. T. Henley's Telegraph Works Co., Ltd.

Recommended. L.p. distribution board (£250).—Brookhirst Switchgear, Ltd.

Notes

I.E.E. Speaking Portraits

The Council of the Institution of Electrical Engineers recently discussed the works of great electrical engineers of the past, and it was remarked how invaluable it would have been had it been possible to have had, for example, a talking film of Faraday and other early pioneers. It was suggested that while such a procedure had been impossible in the past, it would be a good idea to proceed with it now, but difficulty was experienced because the Institution has no funds available which could be devoted to such a purpose. Mr. V. Z. de Ferranti then suggested that the cost of such films might be defrayed by individual members, and he offered to pay for the first one. This offer was accepted, and it is fitting that the first film is to feature Sir J. Ambrose Fleming, the inventor of the thermionic valve. As was announced in the I.E.E. annual report, other films will be made from time to time, and it is hoped to build up for the Institution a library of "speaking portraits" of great electrical men of this age, so that future generations may have the opportunity not only of reading the works of these men but also of seeing and hearing them as they were in their lifetime.

Synthetic-resin Insulating Sheets

The Specification for insulating boards and tubes made from paper or paper pulp treated with synthetic resin and bonded together under the influence of heat and pressure issued in 1929 was limited to Grade II material, which is suitable for use on oil-immersed apparatus and on low-voltage apparatus working in air in dry situations. For certain purposes, such as the insulation of apparatus working in humid atmospheres, and for the production of components by machining operations, a different grade of the same class of material is required, and this (higher) grade is now covered by the recently issued British Standard Specification for Grade I synthetic-resin bonded-paper sheets for electrical purposes (B.S.S., No. 547-1934). Grade I material is known commercially as paxolin, tufnol, bakelite, &c., and the specification gives limits for the electrical and mechanical properties and describes the methods of test. A useful appendix gives an abridged schedule of tests recommended for application to material intended for certain specific uses. Copies of this Specification (No. 547-1934) may be obtained from the British Standards Institution, 28, Victoria St., S.W.1, price 2s. 2d. post free.

The Supervisors' Papers Competition

The Association of Supervising Electrical Engineers announces that July 27th is the last day for the receipt of papers for the annual W. E. Highfield Shield competition. From a fund contributed by British Insulated Cables, Ltd., W. T. Henley's Telegraph Works Co., Ltd., and Johnson & Phillips, Ltd., cash prizes will be awarded for the best three members' papers and two associates' papers; the winner of the member's first prize will hold the Highfield Shield for one year. The board of examiners consists of Messrs. J. M. Kennedy, W. E. Highfield, J. M. Crowdy, and W. Lang, and the prizes will be presented at the first meeting of the 1934-35 session in October next.

International Conference on Physics

At the invitation of the Royal Society a joint conference of the International Union of Pure and Applied Physics and of the Physical Society will take place in London in October next under the presidencies of Prof. Millikan and Lord Rayleigh. The week's proceedings will include discussions on nuclear physics, with an opening survey by Lord Rutherford, and on certain aspects of the theory of the solid state of matter, with an opening review by Sir William Bragg. Reports will be presented by the Union's Symbols, Units and Nomenclature Commission and by Dr. Hales's Committee on Instruments and Instrumental Methods. The Cavendish Laboratory, Cambridge, and the National Physical Laboratory, Teddington, will be visited.

The Society of Engineers

The Society of Engineers (Inc.) arranged a dinner and meeting in Birmingham recently with the object of forming a Birmingham section. Mr. A. M. A. Struben, the president, Lt.-Col. H. O. Hawkins, and Mr. B. B. Tarring, members of Council, and a number of the local members attended. A preliminary committee was formed, with Mr. S. C. Eagles as chairman and honorary secretary. It is thought that the section will be of advantage to local members as well as to the Society, and it is hoped that members in other areas will start similar sections.

Improvement in Incandescent Lamps

Investigations that have been made by M. Georges Claude and his collaborators during the last twenty years in connection with the replacement of argon by krypton and xenon in incandescent lamps in order to increase their yield of light have now entered a decisive phase, says *Reuter's Trade Service* (Paris). At a meeting of the Académie des Sciences on June 4th M. Claude explained the results of his work. One of his collaborators, M. Gomonet, had submitted large quantities of air to the temperature of liquid air for the sole purpose of extracting the millionth part of krypton and xenon it contained and had succeeeded. Indeed, said M. Claude, with apparatus able to deal with 100,000 or 200,000 cu. m. an hour sufficient quantities of these gases could be obtained at a reasonable price. Moreover, another of M. Claude's collaborators, M. André N. Claude, whose work on "cold light" tubes is already known, had spent much time on the study of the very special conditions under which the employment in incandescent lamps of xenon and krypton could be made fully efficacious. The increased yield obtained under these conditions would not be less than 35 per cent. for 25-W lamps of the usual type, and the expenditure on krypton and xenon, produced under M. Gomonet's conditions, would represent only a tiny part of the economy in the consumption of energy which the gas effects.

Generation of Electricity in May

The official returns rendered to the Electricity Commissioners show that 1,125 million kWh was generated by authorised undertakers in Great Britain during May, 1934, as compared with the revised figure of 1,005 million kWh in the corresponding month of 1933—an increase of 120 million kWh or 11.9 per cent. The number of working days in the month (i.e., excluding Sundays and Bank Holidays) was twenty-six, as against twenty-seven last year.

During the first five months of 1934, up to the end of May, the total electricity generated by authorised undertakers was 6,581 million kWh as compared with the revised figure of 5,610 million kWh for the corresponding period of 1933, representing an increase of 971 million kWh or 17.3 per cent. The following table shows the output for the first five months of 1933 and 1934 :—

	1933. kWh (millions)	1934. kWh (millions)	Inc. per cent.
Jan.	1,336	1,536	14.8
Feb.	1,151	1,343	16.5
March	1,160	1,390	19.6
April	952	1,187	24.5
May	1,005	1,125	11.9

Gas-discharge Lamp Conversion Kit

To enable the present owners of standard Benjamin "Duoflux" floodlights to take advantage of the increased illumination at lower running costs, provided by the new gaseous discharge lamps, Messrs. Benjamin Electric, Ltd., Brantwood Works, Tottenham, N.17, announce the introduction of a special conversion kit.

This comprises a heat-resisting glass cylinder to surround the gaseous discharge lamp and so protect it from rain, an upper reflector to fit over the neck of the lamp and thus prevent light being wasted in the canopy of the reflector, a cast supporting ring for the glass cylinder, a suitable lampholder strap to bring the lamp into its correct focal position, and a tin of reflector cleaner.

As the dimensions of the various makes of discharge lamps vary somewhat, the strap varies in length between 1½ and 3 in. The make of lamp intended to be used should, therefore, be mentioned when ordering the conversion kits. The complete kit is retailed at 39s.

Appointments Vacant

Owing to a printer's error, the qualifications required by Coventry Corporation Electricity Department from applicants for the position of senior male assistant at the new showrooms were incorrectly stated in the Department's advertisement in our last issue. The correct details are given in our advertisement pages to-day.

Engineer and manager for the Wick Town Council electricity undertaking (commencing salary £400 per annum).

Distribution change-over engineer for Buxton Electricity Department (salary £375).

Power station engineer for the central power station of the Basrah Port Directorate.

(See our classified advertisements.)

Forthcoming Events

Physical Society.—Friday, June 15th. Imperial College of Science and Technology, S.W.7. 5 p.m. Short papers.

Institution of Heating and Ventilating Engineers.—June 18th-20th. Summer meeting at Queen's Hotel, Hastings.

Institution of Electrical Engineers.—Thursday, June 21st. Natural History Museum, S.W. Annual conversazione. Wednesday, July 11th. Institution, London. Conversazione for overseas members. (*North-Western Students Section*).—Saturday, June 16th. Joint summer visit to Southport with the Liverpool Students' Section. (*South Midland Centre*).—Wednesday, July 4th. Summer meeting. Visit to Callender's Cable Works.

Electrical Contractors' Association.—June 27th-29th. Buxton. Annual conference.

Junior Institution of Engineers.—June 27th-29th. London. Fiftieth anniversary celebrations.

Makers' Names Wanted

LYTNETE electric paint softener.
PHŒNIX vacuum cleaner.
WITELITE electrical fittings.
RADIOLITE electrical fittings.
EPOX fuse carriers.
ECLIPSE boiling plate.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. W. E. Butler has been appointed secretary of the London Students' Section of the Institution of Electrical Engineers. He is connected with the Associated Electrical Industrial organisation and is engaged in the Test Department Laboratory at the Willesden works.

Mr. W. E. Butler

Mr. J. M. Kennedy has accepted the invitation of the Board of Control of the Association of Supervising Electrical Engineers to continue as president of the Association for a further year. He will deliver his second presidential address at the opening meeting of the 1934-35 session of the Association in October next.

Mr. J. D. Watson, M.Inst.C.E., of Messrs. Dodd and Watson, was elected chairman of the committee of the Association of Consulting Engineers for the ensuing year at the first meeting of the new Committee held last week.

Mr. F. Wright, A.M.I.E.E., chief electrical engineer at the works of Matthews and Yates, Ltd., electrical and general engineers, of Swinton, near Manchester, was married on May 30th to Miss Evelyn Salt, of Swinton, and has been presented by the staff with a canteen of cutlery.

Mr. E. A. Mills, who has been appointed to succeed Mr. L. L. Robinson as borough electrical engineer at Hackney, was recently given a complimentary dinner by the Halifax Electrical Employers' Federation. Mr. H. Birkenhead, president of the Federation, said that Mr. Mills, during his stay in Halifax as borough electrical engineer, had dealt successfully with the hire-purchase wiring scheme, which had been extended and improved, and had shown vision and foresight in working with the contractors. He presented Mr. Mills with an electric grandmother clock as an expression of esteem and respect of the members of the Federation. Mr. Mills, in responding, said the success of the Electricity Department was due to the team work which existed throughout the department and to the close co-operation with the contractors' federation which was the department's policy.

Mr. C. A. Norris has been elected a member of the Electricity Commission of Victoria in succession to the late Sir Robert Gibson. The appointment, which is for five years, is part time only and carries a salary of £250 a year. Mr. Norris is general secretary of the National Mutual Life Association of Australasia.

[Jerome

Mr. L. Hart

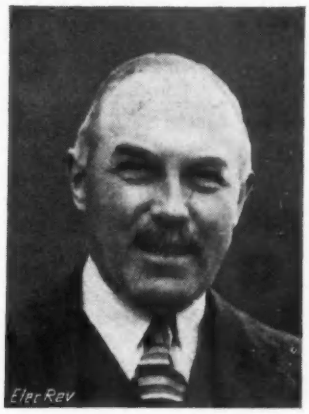
Mr. L. Hart has relinquished the post of publicity manager with Messrs. Blackstone & Co., Ltd., to take up a similar position with the Brush Electrical Engineering Co., Ltd. Mr. Hart joined Messrs. Blackstone in February, 1925, and in 1929 was transferred to Agricultural & General Engineers, Ltd., as assistant publicity manager and chief administration executive. In March, 1931, he returned to Messrs. Blackstone as publicity manager.

Mr. E. W. Bailey, of the Rushden and District Electric Supply Co., Ltd., was married on June 9th to Miss Jane Collier, daughter of Ald. J. V. Collier, of Northampton.

Mr. H. M. Powell, B.Sc., A.M.I.E.E., was married on May 26th, at Christ Church, Surbiton Hill, to Miss Frances Madge.

Mr. R. H. Schofield is being appointed to a seat on the board of Messrs. Ferranti, Ltd. In the position of general sales manager, which he has for so long occupied, Mr. Schofield is being succeeded by **Mr. C. W. Bridgen**, the company's manager in the Midlands and the West Country. Mr. Bridgen has been with the firm for more than twenty years and has a very intimate knowledge of all its products. **Mr. Frank Rostron,** for some years manager of Instrument Sales, has been appointed Export Sales Manager and is about to embark upon an extensive overseas tour.

Major Robert Elliot Douglas, who has been elected president of the Electrical Contractors' Association of Scotland, is chairman and managing director of his family business of James Gray & Son, Ironmongers and Electricians, Ltd., of Edinburgh. He is son of the late Bailie Douglas, who was also a partner in the same business. Major Douglas brings a mature commercial mind and a genius for salesmanship to the chair of the Association. He has long been connected with the public life of Edinburgh and has just completed his year of office as chairman of the Rotary Club. He served for thirty years in the Territorial Army, finishing his military career as major in the 6th Royal Scots.



Major R. E. Douglas

Bailie R. Scott was reappointed chairman at the annual meeting of the Ayrshire Electricity Board held recently in Kilmarnock.

Mr. R. S. Purssell, Deputy Director-General of Telegraphs in India, has been appointed Chief Engineer of the Indian Telegraph Department. He succeeds Mr. F. T. De Monte, who is proceeding on leave preparatory to retirement, and was mentioned in the notes on the King's Birthday Honours in our last issue.

Mr. J. E. Calverley, M.I.E.E., has been appointed to the post of chief engineer and manager of the Traction Department of the English Electric Co., Ltd. Mr. Calverley, who has had long and extensive experience in connection with electric traction and associated problems, has held the position of chief d.c. designer with the English Electric Co., and prior to that was with Dick, Kerr & Co., and has spent twenty-seven years in their service. His experience includes the installation of the first railway to operate on a d.c. voltage of over 3,000 and the design of single-phase locomotive equipments for an important railway abroad. He has also been actively engaged in the development of Diesel-electric traction and in the design of electrical equipment for tramcars and trolley buses. He is well known for his work in the field of h.p. d.c. generation and transmission, and is a recognised authority on mercury arc rectifiers and rectifier systems. He takes over the control of the Traction Department on July 1st, and will succeed Mr. C. E. Fairburn, who has recently been appointed electrical engineer to the L.M.S. Railway.

[Elliott & Fry

Mr. J. E. Calverley

Mr. W. O. Larmuth has severed his connection with Messrs. Larmuth & Bulmer, Ltd., engineers, of Salford, of which company he was chairman and director. He will devote his attention to other interests.

Mr. J. T. Rankin has severed his connection with the Sunbeam Vacuum Cleaner Co., Ltd., of which he was chairman, and has joined the board of a new concern known as Bylock Electric, Ltd., at 109, South Street, Ponders End, Middlesex. His co-director in the new venture is Mr. P. Döring, who was formerly works manager of Messrs. Electrolux in Berlin.

Mr. A. C. Whish is severing his connection with the British Electric Transformer Co., Ltd., as from June 30th.

Obituary

Mr. C. W. Price.—There has just died at New York, suddenly, at the age of 77 years, a man who for many years occupied a position of prominence in the American electrical world, and was also known to many electrical men in this country. We refer to Mr. Charles W. Price, who was for nearly forty years occupant of the editorial chair of a U.S. contemporary known by our own name—the *Electrical Review*. The paper was absorbed by another American publisher and continued under an altered title as a monthly. Mr. Price resigned his position and interest in 1922, but he continued his connection with trade Press and magazine matters to the last, holding amongst other positions the chairmanship of the board of the International Trade Press.

Mr. J. J. Fahie.—By the death of Mr. John Joseph Fahie on Tuesday, at Broughton-in-Furness, the Institution of Electrical Engineers loses, as we believe, its earliest surviving member. Mr. Fahie, who was in his eighty-eighth year, became an associate of the Institution in 1873 and a member in 1877. His name is commemorated in the Fahie Premium awarded for work in connection with telegraphy and telephony.

Mr. M. G. J. Moreton.—The death has occurred of Mr. Mark George J. Moreton, electrical superintendent to the Cardiff Corporation. The funeral took place at the Cardiff Cemetery on June 9th, and was attended by members of the staffs of the Cardiff City Electricity Department and of the Hayes and Docks sub-stations.

Mr. F. W. Climpson.—The death is announced, at the age of fifty-five years, of Mr. Frederick William Climpson, of Hastings, who was in the business of Messrs. William S. Climpson & Sons, electrical contractors, Hastings.

Mr. H. H. Oliver, chief electrical engineer to the Aberdare & Aberaman Gas Co., died on June 9th at the Aberdare Hospital at the age of fifty-eight.

Will.—Mr. E. T. Everett, director of Messrs. Everett, Edgecumbe and Co., Ltd., left £27,715 (net personalty £24,807).

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

C. M. Simpson & Co., Ltd.—Private company. Registered May 31st. Capital, £2,000 in £1 shares (500 6 per cent. cumulative preference and 1,500 ordinary). Objects: To acquire the business of a wholesale dealer in and manufacturer of all electrical and wireless goods, &c., carried on by Chas. M. Simpson at 55, Frogmore Street, Bristol, 1. The first directors are: Chas. M. Simpson (permanent), 24, Hillview, Henleaze, Bristol, and others to be appointed by the subscribers. Registered office: 55, Frogmore Street, Bristol.

Applied Processes, Ltd.—Private company. Registered June 2nd. Capital, £500 in 5s. shares. Objects: To carry on the business of manufacturers of and dealers in insulating materials for wireless, electrical, and all other purposes, waterproofing, anti-corrosive, weather and insect resisting fabrics and impregnated materials, &c. The first directors are: H. C. Pontet and Mrs. Muriel I. Pontet, both of 76, Duncombe Road, Upper Holloway, N.19. Registered office: 76, Duncombe Road, Upper Holloway, N.19.

Bambairtite Battery Co., Ltd.—Private company. Registered June 4th. Capital, £2,000 in £1 shares. Objects: To acquire the patents and registered designs relating to the Bambairtite electric batteries (patentee: Chas. K. Bamber), and to carry on the business of manufacturers of and dealers in electric batteries, accumulators, &c. The first directors are: C. K. Bamber, "The Martyrs," Crawley, Sussex; and K. W. Jones, "Ladock," Upper Mulgrave Road, Cheam, Surrey. Registered office: Westminster Chambers, 9, Victoria Street, S.W.1.

Bridgend Relay Service, Ltd.—Private company. Registered June 6th. Capital, £1,000 in £1 shares. Objects: To establish and maintain wireless signal stations, &c. The first directors are: S. David, 2, Brynglas Terrace, Pyle, Bridgend, and two others. Solicitor: J. T. Howell, Bridgend, Glam.

Star Electric Works (Newcastle), Ltd.—Private company. Registered June 4th. Capital, £500 in £1 shares. Objects: To carry on the business of electrical manufacturers and dealers, &c. The subscribers are: S. A. O. Wherly, "Westmount," Shipley Avenue, Newcastle-on-Tyne; and F. J. Davidson, 10, Werhale Green, Felling-on-Tyne. S. A. O. Wherly is managing director.

H. S. Lawley & Co., Ltd.—Private company. Registered June 7th. Capital, £5,000 in 4,900 6 per cent. non-cumulative participating preferred ordinary shares of £1 and 2,000 ordinary shares of 1s. each. Objects: To carry on the business of manufacturers, exporters and importers of and wholesale and retail dealers in wireless, telephone and telegraphic equipment, electrical apparatus, gramophones, &c. The subscribers are: H. S. Lawley, 26, Elm Walk, Raynes Park; and H. R. Markham, 8, Grand Drive, Raynes Park, S.W.20. H. R. Markham signs documents as director. Registered office: 57, Approach Road, Raynes Park, S.W.20.

Fulton & Wilcock, Ltd.—Private company. Registered in Belfast June 1st. Capital, £3,000 in £1 shares. Objects: To carry on the business of electrical and refrigerating engineers and contractors, radio engineers, &c. The first directors are: J. N. Fulton, 2, Harleston Park, Belfast; and W. J. Wilcock, 8, Denorrton Park, Belfast. Registered office: 33, Wellington Place, Belfast.

Returns of Electrical Companies

General Electric Co., Ltd.—Satisfaction to the extent of £17,500 on March 31st, 1934, of 4¼ per cent. first mortgage debenture and stock secured by trust deed dated March 28th, 1933, and registered April 12th, 1933.

Concordia Electric Safety Lamp Co., Ltd.—Issue on May 7th of £3,900 and on May 28th, 1934, of £900 debentures, part of a series already registered.

Rowland's Electrical Accessories, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, if any, and as collateral security thereto, a mortgage on 157 and 158, Hockley Hill, Birmingham, both dated May 24th, 1934, to secure £1.755. Holder: T. M. Adie, "Symbister," Lanchester Road, Highgate, N.

British Dry Cell Co., Ltd.—Particulars filed of £400 debentures, authorised May 11th, 1934, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Maintenance Contracts, Ltd.—The nominal capital has been increased by the addition of £2,500 beyond the registered capital of £500. The additional capital is divided into 1,000 5 per cent. cumulative preference and 1,500 ordinary shares of £1 each.

Martindale Electric Co., Ltd.—Capital, £200 in £1 shares. Return dated January 12th, 1934. 139 shares taken up. £139 paid. Mortgages and charges, nil.

Westminster Engineering Co., Ltd.—Capital, £25,500 in 12,500 preference and 13,000 ordinary shares of £1. Return dated January 3rd, 1934. 9,279 preference and 8,560 ordinary shares taken up. £14,039 paid on 7,479 preference and 6,560 ordinary shares. £3,800 considered as paid on 1,800 preference and 2,000 ordinary shares. Mortgages and charges, £2,500.

Insular Electric Glowlamp Works, Ltd.—Capital, £1,000 in £10 shares. Return dated January 1st, 1934. All shares taken up. £20 paid. £980 considered as paid. Mortgages and charges, nil.

Wireohms, Ltd.—Capital, £2,000 in £1 shares. Return dated January 3rd, 1934. All shares taken up. £2,000 paid. Mortgages and charges, nil.

Universal Lamp Co., Ltd.—The nominal capital has been increased by the addition of £2,500 in £1 ordinary shares beyond the registered capital of £10,000.

Ever Ready Co. (Great Britain), Ltd.—The nominal capital has been increased by the addition of £500,000 beyond the registered capital of £1,000,000. The additional capital is divided into 2,000,000 ordinary shares of 5s. each.

Rulag Battery Company, Ltd.—Capital, £15,750 in 15,000 preference shares of £1 and 15,000 ordinary shares of 1s. Return dated January 1st, 1934. 10,000 preference and 15,000 ordinary shares taken up. £10,750 paid. Mortgages and charges, nil.

Electric Totalisators, Ltd.—Capital, £50,000 in £1 shares. Return dated January 3rd, 1934. 47,600 shares taken up. £47,600 paid. Mortgages and charges, nil.

Northern Electric Wire Co., Ltd.—Capital, £100 in £1 shares. Return dated January 5th, 1934. Three shares taken up. £3 paid. Mortgages and charges, nil.

City Notes

Telephone Rentals, Ltd.—Presiding at the annual meeting held on June 11th, Mr. F. T. Jackson (chairman and managing director) said that the financial position of the combined British subsidiary companies was very satisfactory. During the year the rental revenue of these subsidiaries had been increased by 10.5 per cent. as compared with a 4 per cent. increase in 1932. Two years ago they entered into an extensive service campaign which involved the renewals of a large number of their older installations. This work was now completed, with the result that considerable benefit would accrue during 1934 and future years. This was already reflected in the monthly profit and loss accounts up to the end of April last. They were continuing their sales development on intensive lines with satisfactory results. The total amount they had invested in revenue-producing installations in the whole of their subsidiaries amounted to £786,093. Both their Continental companies had traded at a profit, and their Australian company had had another successful year. The latter company did a substantial business on the same lines as their subsidiaries in this country, and had also become a great distributing organisation for refrigerators and wireless receiving sets. It owned a factory in Australia which had manufactured practically the whole of the wireless receiving sets distributed. The distribution of refrigerators by this company over the past two years had increased enormously. This business had been built up under protection, and the directors had considered the fact that sooner or later duties in Australia would be reduced and the market thrown open. They had made arrangements with a leading firm in America which would provide the Australian factory with the results of the latest research work and development. By these arrangements they would maintain their hold on the Australian market where they had during the past two years secured 50 per cent. of the total refri-

gerator business. Their new subsidiary, Electro-Rentals, Ltd., which was formed to investigate the possibility of renting out domestic electric appliances, had traded at a small loss, but they considered that the progress made was very promising.

Edmundson's Electricity Corporation, Ltd., reports a net profit for the year ended March 31st last of £402,839, as compared with £342,795 in 1932-33. It is proposed to place £15,000 to reserve (same) and to pay a final dividend on the ordinary shares of 4 per cent., maintaining the distribution for the year at 7 per cent. The amount carried forward is £41,855. During the year the authorised capital of the company was increased to £7,000,000 by the creation of a further 1,000,000 ordinary shares of £1 each and 400,000 ordinary shares were offered to shareholders. A further 146,005 6 per cent. cumulative preference shares were issued in connection with the acquisition of additional shares in the Urban Electric Supply Co., Ltd. The balance of the 5 per cent. debenture stock was redeemed on June 30th last. The Guernsey Electric Light & Power Co., Ltd., was acquired by the States of Guernsey. The Corporation's interest in the East Anglian Electric Supply Co., Ltd., has been disposed of by sale to the Urban Electric Supply Co. During the year Mr. A. N. Rye, who was joint managing director, severed his connection with the Corporation, and Mr. J. T. H. Legge was appointed managing director. Since the end of the year Mr. R. P. Sloan has been appointed an additional director. A table included in the report gives particulars of the company's investments; this is reproduced below:—

Company.	Holding.
	£
Beds, Cambs and Hunts Elec. Co.	282,066 (£250,000 deb.)
Cambridge E.S. Co.	376,374
Cookham and District Elec. Corp.	3,536
Ilfracombe E.L. and P. Co.	49,756
Isle of Wight E. L. and P. Co.	382,916
Lymington E. L. and P. Co.	67,744
Melton Mowbray E. L. Co.	42,680 (£19,000 deb.)
Oxford Elec. Co.	284,515
Ramsgate and District E. S. Co.	137.619
Reading E. S. Co.	389,302
Salisbury E. L. and S. Co.	97,929 (£5,500 deb.)
S. W. and S. Elec. Power Co.	2,229,518
Thames Valley E. S. Co.	3,636
Tisbury E. S. Co.	2,666
Urban Elec. Supply Co.	1,331,923
Wessex Elec. Co.	705,730 (£300,000 deb.)
Western Elec. Supply Co.	428,097
Wycombe E. L. and P. Co.	154,776 (£33,796 deb.)
Yeovil E. L. and P. Co.	56,500
Total...	£7,026,383 (£608,296 debentures)

These and other subsidiary companies are set out in a chart accompanying the report. Meeting: June 20th.

The Electric Furnace Co., Ltd., reports a net profit for the year ended March 31st last of £20,575, as against £5,920 for 1932-33, which with £452 brought in makes £21,027. It is proposed to pay a final ordinary dividend of 4½ per cent., making 7 per cent. for the year (against nil), and to carry forward £3,044. The report refers to the improved conditions of business, especially at home. Several new steel melting shops in the Sheffield district have recently been equipped with high-frequency melting units. Orders for furnaces were received from Northern Rhodesia, the Transvaal, Sweden, France and Belgium, while the proportion of orders for this country has increased substantially. The general improvement in the metal trades has gained momentum in Great Britain, but in Continental countries, other than Scandinavia and Belgium, orders have been scarce. The policy of co-operation with important British and Continental firms mentioned in last year's report has proved to be of great value to the company, and is being extended. The salaries of the staff, which were reduced in 1931, have now all been restored to a level at least as high as that previously paid.

The Madras Electric Supply Corporation, Ltd., held its annual meeting on June 6th, when Mr. J. Gray (chairman), who presided, said that the electricity generated showed an increase on 1932 of 3.4 per cent. and the sales 2.2 per cent. The sales for power represented 71 per cent., lighting and fans 23 per cent., and street lighting 6 per cent. The number of consumers increased by 7.8 per cent. The gross revenue remained practically unchanged, which was due to the reduction in the tariff for lighting and fans and other concessions. Fortunately, the increased demand for power developed earlier than was anticipated, with the result that the revenue from all sources showed only a small reduction. The prospects for the future were encouraging.

Callender's Cable & Construction Co., Ltd., reports a balance at profit and loss account for 1933 of £281,385, as compared with £277,778 in the preceding year. After meeting depreciation, debenture interest and preference dividends, and adding £292,932 brought in, there is a balance available of £462,818. It is proposed to maintain the ordinary dividend for the year at 15 per cent. and to carry forward £294,230. The report states that there have been no specially large contracts secured, but a fair amount of orders for the smaller types of mains and distributors has been obtained. In India the contract for the Uhl River distribution has been completed, and although other contracts for important work in various parts of India have been secured, the final result, although not quite so large as in the previous year, has been a useful addition to the company's balance. Further considerable orders have been obtained and are now in course of execution. There was little progress in general overseas business, but during the last few months there has been a distinct improvement in this direction. The contracts secured for a large section of the grid for the Central Electricity Board have now been completed. Subsidiary extensions continue to be placed and some are now in course of erection. The Anchor Cable Co., Ltd., in spite of keen competition is able to repeat its dividend of 20 per cent. Some of the ordinary shares of Callenders Share & Investment Trust, Ltd., a subsidiary company, have been held for many years by outside shareholders; during the year the company acquired all those shares. The debenture stock of that company was redeemed on May 31st last, and so the whole of the property and interest of the Trust Company has become vested in the Callender Cable Company. The Anchor Cable Co. has given notice to the holders of its debenture stock to redeem that stock on June 30th.

The Electrical Finance and Securities Co., Ltd.—Presiding at the annual meeting on June 7th, Mr. G. H. Nisbett (chairman) said that the trading of each of their subsidiary companies continued to progress. Aggregating the individual figures, at the end of 1933 they had made the following percentage advances during the year:—In number of consumers, 20; in kW connected, 22; in electricity sold, 14; and in reserves, 17. On the other hand, the gross revenue only advanced by 9 per cent., the difference being due to the reductions made in electricity charges. According to the terms of the Provisional Order under which they operated in the Pinner district, the local authority had the right at the end of twenty-one years from its commencement to purchase their undertaking in that area. The authority had served them with notice of its intention to exercise this option.

The Nigerian Electricity Supply Corporation, Ltd., held its annual meeting on June 12th, when Major E. Seaborn Marks (chairman) said they were now the sole suppliers of hydro-electric energy on the Baunchi Plateau tin fields. During the year they had distributed 12,403,231 kWh; the cost of generating had been reduced from 0.275d. to 0.224d. per kWh; 10,337,971 kWh had been supplied by the Kurra power house and 2,065,260 kWh by Kwall. The position of the tin mines had improved. During the lean years the corporation, by sacrifices, had considerably assisted its consumers, and it could now look forward to the obligations under their contracts for the supply of electricity being fulfilled and to receiving a steady income. By the end of the year, the permitted output of the mines should again be increased. When once they got back to normal times the net revenue would be adaquate to pay the full interest on their preferred ordinary shares and a bonus upon those of the ordinary shares.

The Telsen Electric Co., Ltd., held its annual meeting on June 13th, when Mr. W. Henderson-Cleland (chairman) said that the factory, under Mr. A. Rowse's managing directorship, had been entirely replanned so as to deal more efficiently with the production of the radio side of the business. They had made arrangements for the manufacture of electrolytic meters, current demand indicators, mercury type switches, thermostatic control devices, and other electrical products related to electrical distribution. They had acquired the right to use certain radio patents which had stood in the way of development, and they were now in the position to market a full range of sets completely in line with up-to-date requirements. They had also become involved in differences in the distributing trade with reference to their methods of distribution. As a result of discussions that unsatisfactory position had been disposed of. They were now planning their forward production in such a way that the requirements of the distributing trade could be adequately met at the time the demand existed on the part of the public.

Ruston & Hornsby, Ltd., report a trading profit for the year ended March 31st last of £53,224 and a dividend from Ruston-Bucyms of £18,600, making £71,824. Directors' fees absorbed £1,439, debenture interest £25,050, and a debit of £119,465 is brought in. After deducting the credit balance for the year, a debit of £74,130 is carrried forward. The report states that there was a considerable expansion in sales, but the volume of business at present market prices is still insufficient to produce satisfactory profits. On the whole, the outlook is more encouraging than for many years.

The British Aluminium Co., Ltd.—A separate meeting of the holders of the 6 per cent. cumulative preference shares and an extraordinary general meeting were held on June 12th, at which resolutions were passed sanctioning an increase in the capital of the company to £4,500,000 by the creation of 800,000 6 per cent. cumulative preference shares of £1 each and 1,300,000 ordinary shares of £1 each.

W. T. Henley's Telegraph Works Co., Ltd., have declared a final dividend on the ordinary shares of 2s. 6d. per share, less tax, making 4s. per share for the year (same). It is also proposed to pay a cash bonus of 2s. per share, less tax (unchanged).

Mirrlees, Bickerton & Day, Ltd., have announced an ordinary dividend of 3 per cent. (same) for the year ended March 31st last.

Stocks and Shares

TUESDAY EVENING.

WITH the end of June approaching, Stock Exchange markets find the usual seasonal disposition on the part of the public to exercise a certain amount of restraint in the purchase of fresh stock for which payment will be required on this side of June 30th. Recent new issues have absorbed a good deal of the floating supplies of money that were available, and there is talk, moreover, of substantial loans likely to be forthcoming in the near future. The consequence is that Stock Exchange markets are, on the whole, quiet, attracting noticeably less attention than was the case a couple of months back. Speculation and speculative investment are both concentrating on gold-mining shares, the result being that Industrials are thrown somewhat into the background. Declaration of the usual dividends upon the ordinary shares of Callender's and of Henley's satisfied previous estimates.

The market for home electricity supply shares continues a little uncertain. Brompton ordinary shares, which had been lowered to 33s. 6d., have recovered to 34s. At the same price, Westminsters show a fall of 6d. a share. St. James's have receded to 35s. 6d., South London to 36s. Save for these move-

ments, the market for London electricity supply shares is very quiet, waiting upon the course of events. Amongst the provincial issues, Midland Counties, Bournemouth and Poole, and Yorkshire Electric ordinary are rather lower. There has been no fresh pressure to sell electricity supply shares; whenever shares have come to market in round amounts, they have found ready homes. The general body of the investing public is doing very little, however. It will be noticed that, on the fall, the prices of the principal London shares offer returns of about 4½ per cent.—more than they have paid, that is to say, for some time past.

Shares in the provincial group give rather less income than those in the list of London companies, owing to the expectation, so often mentioned here, of fresh issues being made by the former at bonus prices. The apprehension is still apparent that the Central Electricity Board may win from the companies part of the business which the latter are now securing, and, in its place, substitute direct supply. Small falls are shown by Southern Areas at 22s. 9d., Llanelly at 23s. 9d., West Devon at 24s. 6d., and West Gloucestershire ordinary at 85.

Stocks on Offer

Of the West Gloucestershire preference stock, £1,500 can be bought at 106½. The recently issued 3½ per cent. registered stock of the State Electricity Commission of Victoria, Australia, is on offer, as to £10,000 stock, at 97, free of stamp, this paying £3 12s. per cent. on the money. The issue was made recently at 96. A moderate amount of Perak River Hydro Electric Power 4 per cent. prior lien debenture can be bought at 101, yielding £3 19s. per cent., with interest payments due at the end of March and September. The first interest on the State Electricity of Victoria stock is due on November 1st, when the "broken" amount of £1 7s. 6d. per cent. becomes payable. The West Gloucestershire 4 per cent. debenture stock will receive a full interest payment on September 15th next.

Edmundson's

Edmundson's Electricity Corporation makes a good showing in its annual report, the profit of £402,800 for the year being £60,000 better than that secured in the previous twelve months. The dividend is maintained at 7 per cent. for the year. A higher rate could have been paid, and without difficulty, but the directors have elected to strengthen the carry-over, which now amounts to £41,900. The shares are quoted at 37s. 6d. ex dividend. A consolidated balance-sheet is a new feature in the accounts.

Home and Foreign Traction

London Passenger Transport "C" stock is dull at 73½, showing a fall of a point on the week, following upon previous declines. The reason for the heaviness is thought to be connected with the claim against the Board put forward by Thomas Tilling. The hearing of the Company's case was resumed on Monday in this week.

British Electric Traction deferred stock has gained 55 points, rising to 630 upon publication of an excellent report. The dividend on the stock is again 5 per cent., and the capital bonus is 10 per cent. In the foreign list, Anglo-Argentine Tramways 5 per cent. debenture doubled its previous quotation by advancing to 6. Brazilian Tractions are ¾ higher at 9½.

Manufacturing and Equipment

Maintenance of the dividends on Callenders, making 15 per cent., and Henleys, making 30 per cent., for the year, has had but little effect upon the prices. Callenders are 3 ex dividend; Henleys at 5¾ are ¼ down. The dividend announcements aroused satisfaction in the Stock Exchange market. British Insulated are steady at 3 7/16, and Enfields at 4 5/16. A further fall in Brush ordinary lowered the price to 33. Siemens are 9d. down at 16s. 3d. Arons at 51s. show a fall of 1s. Reyrolles are unchanged at 52s. 6d. Telephone Rentals at 8s. 1½d. are ex dividend. The chairman at the meeting on Monday this week contended that in this country we are still under-telephoned; progress is shown, however, by the rental revenue of the company having increased by 10½ per cent. The Australian branch is making refrigerators, which seem to be increasing in popularity. It was only the other day that mention was made here of the Electrical & Musical Industries having taken up this industry, through its H.M.V. Gramophone branch. Radio Central Exchanges shares at 5s. 1½d. have settled into a steady market. There are available a few thousand Metropolitan Electric Cable & Construction 5½ per cent. Preference shares at 21s. 9d., free of stamp and fee.

Mexicans and Others

Inquiry as to the prospects for Mexican utility companies can be answered only in very cautious vein. The present position is so uncertain that the bonds and shares of Mexican Light & Power, Mexico Tramways and other such companies must be considered highly speculative holdings. That there might be a change for the better, and at any time, is always on the cards, but the prices for the various "securities" afford conclusive evidence of the regard in which the issues are held.

British iron and steel shares hold their ground. The rubber share market is quietly steady. No improvement has taken place in the outlook for Cables & Wireless stocks.

The 1934 edition of Atkin's manual is just published. This excellent book of reference, compiled by a well known Stock Exchange firm, is as nearly indispensable as anything of its nature can possibly be.

Share List of Electrical Companies

HOME ELECTRICITY COMPANIES.

	Nom.	Dividend. 1932.	Dividend. 1933.	Price. June 12.	Rise or Fall.	Yield. p.c. £ s. d.
Bournemouth and Poole	1	15	15	74/6	−6d.	4 0 5
Brompton Ordinary	1	7	7	34/-	+6d.	4 2 4
Charing Cross Ordinary	1	7	7	34/6	—	4 1 2
Chelsea	1	7	7	34/-	—	4 2 4
City of London	1	7½	7½	35/-	—	4 5 9
Clyde Valley	1	7	7	38/9	—	3 12 4
County of London...	1	10½	10½	55/9	—	3 15 4
Edmundson's 7% Pref.	1	7	7	34/-	—	4 2 4
Elec. Dis. Yorkshire	1	9	9	47/6	—	3 16 0
Elec. Supply Corporation ...	1	11	11	73/9	—	2 17 9
Kensington Ordinary	1	7	7	34/6	—	4 1 2
Lancs Light and Power	1	7	7½	36/3	—	4 2 8
London Electric	1	7	7	34/6	—	4 1 2
Metropolitan	1	10	10	51/3	—	3 18 2
Midland Counties	1	7	7	35/9	−9d.	3 18 4
Mid. Elec. Power	1	8	8	40/-	—	4 0 0
North Eastern Electric Ordinary	1	6	6	31/9	—	3 15 0
Do. 7% Pref.	1	7	7	35/-	—	4 0 0
Northampton	1	10	10	53/9	—	3 14 3
Notting Hill 6% Pref.	10	6	6	14½	—	4 2 9
North Met. Elec. Ordinary ...	1	10	10	61/3	-	3 5 3
Do. do. 6% Pref. ...	1	6	6	31/6	—	3 16 2
St. James' and Pall Mall ...	1	7	7½	35/6	−6d.	4 4 6
Scottish Power	1	8	8	38/9	—	4 2 6
South London	1	7	7	36/-	−1/-	3 17 9
Westminster Ordinary	1	7	7	34/-	−6d.	4 2 4
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	21/-	—	7 2 10
Yorkshire Elec.	1	8	8	47/-	−6d.	3 8 2

PUBLIC BOARDS.

		1931.	1932.			
Central Electricity, 1950–70 ...	Stock	5	5	116	—	4 6 2
Do. 1955–75 ...	,,	5	5	117	—	4 5 6
Do. 1951–73 ...	,,	4½	4½	109xd	—	4 1 1
Do. 1963–93 ...	,,	—	3½	97	—	3 10 8
London & Home Counties, 1955–75 ..		4½	4½	110	—	4 1 10
London Passenger Transport, A...	,,	—	4½	118xd	—	3 16 4
Do. do. B...	,,	—	5	122xd	—	4 2 0
Do. do. C...	,,	—	—	73½	-d	—
West Midlands Joint Elec. 1948–68	,	—	5	114	—	4 7 9

TELEGRAPH AND TELEPHONES

American Tel. & Tel.	$100	9	9	112½	—	8 0 0
Anglo-Am. Tel. Pref.	Stock	6	6	114	—	5 5 5
Do. Def.	,,	1½	1½	28	—	5 7 2
Cables & Wireless 5½% Pref. ...	,,	2¾	2¾	65½	−3	4 4 0
Do. A. 7½% Ord.	,,	Nil	Nil	14½	−1½	—
Do. B. Ord	,,	Nil	Nil	7½	—	—
Globe Tel. and T. Ord.	10	Nil	2½	8½xd	−⅝	2 19 0
Do. do. Pref.	10	6	6	12¾xd	—	4 14 4
Great Northern Tel.	10	20	20	38	−1	5 5 3
Marconi-Marine	1	10	7½	31/3	—	4 16 0
Oricntal Telephone Ord.	1	12	12	3½	—	*3 16 10

HOME AND FOREIGN TRAMS, ETC

Anglo-Arg. Trams First Pref. ...	5	Nil	Nil	1/6	—	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb. ...— ...	Stock	Nil	Nil	6	+3	—
British Electric Traction Df. Ord.	,,	5	5	630	+55	—
Do. do. Pref. Ord.	,,	8	8	157½	—	5 1 7
Brazil Traction	100	—	—	9½	+¾	—
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	105	—	4 15 3
Mexico Trams, 5% Bonds ...	—	5	5	24½	—	20 8 0
Mexican Light Common	100	Nil	Nil	8	—	—
Do. 7% Pref.	100	7	7	7½	—	—
Do. 1st Bonds...	—	5	5	42½	—	10 10 6
Victoria Falls Ord.	1	15	20	6⅝	+1/16	3 1 0
Yorkshire (West Riding) ...	1	2½	5	23/9	—	4 4 0

MANUFACTURING COMPANIES.

Assoc. Elec. Ord.	1	4	3	17/3	—	3 9 7
Do. Pref.	1	8	8	32/6	—	4 18 6
Babcock & Wilcox	1	9	6	2	—	3 0 0
British Aluminium Ord.	1	5	5	28/3	—	3 11 0
British Insulated Ord.	1	15	15	68/9	—	4 7 3
Brush Ord.	Stock	Nil	Nil	33	−2	—
Callender's...	1	15	15	3xd	—	5 0 0
Do. 6½% Pref.	1	6½	6½	30/0xd	—	4 6 8
Crompton Parkinson Ord. ...	5/-	22½	12½	26/6xd	—	4 14 4
Do. 8% Pref.	1	8	8	32/6xd	+6d.	4 18 6
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	6 2 5
Do. 5% Deb.	Stock	5	5	102½	—	4 17 7
Electric Construction	1	Nil	Nil	11/3	—	—
Enfield Cable Ord.	1	25	20	86/3	—	4 13 0
English Electric	1	Nil	Nil	5/9	−6d.	—
Do. do. Pref.	1	Nil	Nil	9/6	−6d.	—
Ever Ready	5/-	35	35	28/6	−6d.	6 2 8
Ferranti Pref.	1	7	7	27/6	+6d.	5 1 10
G.E.C. Pref.	1	6½	6½	31/3xd	—	4 3 2
Do. Ord.	1	8	8	42/-	—	4 0 0
Henley's	1	30	30	5¾	−¼	5 4 4
Do. 4½% Pref.	5	4½	4½	5½	—	4 1 9
India-Rubber Preferred	1	—	—	17/6	—	—
Johnson & Phillips	1	5	5	23/3	—	4 6 0
Siemens Ord.	1	6½	4	16/3	−9d.	4 18 6
Telegraph Construction	£1	Nil	Nil	21/-	−1/16	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parenthesis are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1932

25681. "Methods and apparatus for the detection and measurement of frequency variations of electromagnetic oscillations, and the like purposes." H. J. J. M. de R. de Bellescize. January 8th, 1932. (410482.)

28096. "High-frequency selective electrical circuit arrangements." Marconi's Wireless Telegraph Co., Ltd., and N. M. Rust. October 8th, 1932. (Cognate application 32055/32.) (410499.)

32081. "Manufacture of radio receivers and the like." G. J. Trapp. November 14th, 1932. (410470.)

32225. "Electromagnetic brakes." W. L. Spence. November 15th, 1932. (Cognate application 22240/33.) (410471.)

32312. "Lamps, particularly for motor vehicles." C. X. Jansma and M. Van der Velden. November 27th, 1931 (410477.)

32325. "Electric circuits associated with cathode-ray tubes." Electrical & Musical Industries, Ltd., and J. D. McGee. November 15th, 1932. (410478.)

32428. "Manufacture of permanent-magnet electrical apparatus." H. S. Tenny and British Rola Co., Ltd. November 16th, 1932. (410491.)

32497. "Electric plug-and-socket couplings." J. A. Crabtree and B. G. Harrison. November 17th, 1932. (410505.)

32702. "Electric relays." L. H. Peter, R. M. MacGregor, and Westinghouse Brake & Saxby Signal Co., Ltd. November 18th, 1932. (410516.)

33239. "Code signal receivers such as radio alarm receivers." Standard Telephones & Cables, Ltd. (G. Deakin, P. Giroud, S. J. Schreiber and G. P. Chevigny). November 24th, 1932. (Cognate application 35547/32.) (410523.)

33284. "Apparatus for signalling the passage of vehicles." Automatic Electric Co., Ltd., and H. S. Woodhead. November 24th, 1932. (410527.)

33722. "Type of cone for use in wireless loudspeakers, telephones and the like." F. Harrison. November 29th, 1932 (410535.)

35661. "Electro-optical light valves for use in television, photo-telegraphic, sound-recording and like systems." W. W. Jacomb, T. W. Collier, and Baird Television, Ltd. December 16th, 1932. (410546.)

36312. "Muting devices for radio-receiving apparatus." General Electric Co., Ltd., and C. N. Smyth. December 22nd, 1932. (410549.)

1933

249. "Electrically driven clocks, particularly savings clocks." T. A. Jensen. January 4th, 1932. (410554.)

536. "Electric discharge tubes." Siemens Electric Lamps & Supplies, Ltd., and J. N. Aldington. January 6th, 1933. (410558.)

1714. "Permanent magnets for sound receivers and reproducers." Sheffield Steel Products, Ltd., and C. W. Collins. January 18th, 1933. (410562.)

2258. "Volume control in radio circuits." E. K. Cole, Ltd., E. J. Wyborn, and A. W. Martin. January 24th, 1933. (410567.)

3027. "Imitation fires." General Electric Co., Ltd., and G. S. Cattell. January 31st, 1933. (410568.)

3664. "Electric cut-outs." Sykes & Dyson, Ltd., P. Sykes, and W. Cooper. February 7th, 1933. (410570.)

5801. "Electric cathode-glow devices." Siemens Electric Lamps & Supplies, Ltd., P. D. Oakley, and J. N. Aldington. February 25th, 1933. (410581.)

6065. "Electric cables for heating soil and like purposes." C. J. Beaver, H. M. Crellin, and W. T. Glover & Co., Ltd. February 28th, 1933. (410583.)

7369. "Means for minimising retroaction between transmitting and receiving apparatus in alternating current signalling systems." General Electric Co., Ltd., and E. P. Fairbairn. March 10th, 1933. (410588.)

7453. "Electromagnetic clutches." British Thomson-Houston Co., Ltd., and F. W. Lanchester. March 11th, 1933. (410589.)

8262. "Electric hand torches." M. A. Hassid. March 18th, 1933. (410593.)

8593. Electric heating elements for kettles and other vessels or containers." Eveson Bros. (1928), Ltd., and J. C. Eveson. March 22nd, 1933. (410594.)

12189. "Electric discharge devices." M-O Valve Co., Ltd., and W. H. Aldous. April 26th, 1933. (410606.)

13590. "Electric battery lamp switch." Elektrotechnische Fabrik Schmidt & Co. Ges. May 10th, 1932. (410613.)

16278. "Electron-discharge devices and circuits incorporating the same." Marconi's Wireless Telegraph Co., Ltd. July 12th, 1932. (410619.)

16469. "Gasfilled electric arc discharge lamps." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 30th, 1932. (410621.)

17459. "Fusible cut-out." Allmänna Svenska Elektriska Aktiebolaget. June 22nd, 1932. (410626.)

17899. "Device employing electronic tubes." Radioakt-Ges., D. S. Loewe and Dr. P. Kapteyn. June 24th, 1932. (Cognate application 17900/33.) (410628.)

18416. "Apparatus for timing races or other events." Electrical Research Products, Inc. July 1st, 1932. (410630.)

20156. "Electric motor controllers." Igranic Electric Co., Ltd. July 15th, 1932. (410642.)

20662. "Multi-grid thermionic tubes and connection system for same." Radioakt-Ges., D. S. Loewe and W. Stoff. July 22nd, 1932. (410644.)

21303. "Electroplating of articles with chromium." Soc. d'Electrochimie, d'Electrométallurgie et des Aciéries Electriques d'Ugine. July 29th, 1932. (410645.)

21931. "Luminous electric discharge tubes." General Electric Co., Ltd. August 13th, 1932. (410648.)

23264. "Snap-action electric switches." British Thomson-Houston Co., Ltd. August 20th, 1932. (410656.)

23982. "Electric incandescent lamp bulbs or the like." Oesterreichische Glasfabriken und Raffinerien J. Inwald Akt.-Ges. March 14th, 1933. (410658.)

24918. "Printing-telegraphs, applicable in particular to ultra-rapid telegraphy." Soc. Française Radio-Electrique. September 28th, 1932. (Cognate applications 24919/33 and 24920/33.) (410663.)

25616. "Electric flat-irons." British Thomson-Houston Co., Ltd. September 15th, 1932. (410665.)

25620. "Electric discharge tubes." British Thomson-Houston Co., Ltd. May 4th, 1933. (410666.)

26400. "Radio and like modulated carrier-wave transmitters." Marconi's Wireless Telegraph Co., Ltd. October 31st, 1932. (410668.)

26945. "Time-controlled electric switches." E. V. Garcia. October 5th, 1932. (410673.)

27300. "Radio-receiving systems." Radio Frequency Laboratories, Inc. November 4th, 1932. (410674.)

28842. "Television and like systems." J. C. Wilson and Baird Television, Ltd. October 18th, 1933. (410678.)

29493. "Cooling apparatus applicable to electric vapour discharge apparatus." English Electric Co., Ltd. October 24th, 1932. (410681.)

29769. "Electric condensers." Elektrizitäts Akt.-Ges. Hydrawerk. November 17th, 1932. (410493.)

32005. "Electric arc welding systems." British Thomson-Houston Co., Ltd. November 17th, 1932. (410494.)

34457. "Electric discharge devices." General Electric Co., Ltd. December 7th, 1932. (410700.)

35612. Vacuum-tight enclosed carbon arc lamps." General Electric Co., Ltd. December 27th, 1932. (410706.)

1934

119. "Electrical heating apparatus." F. Angell. January 2nd, 1934. (Addition to 375054.) (410712.)

2153. "Telephones." W. C. Bailey and R. E. Ray. January 22nd, 1934. (410716.)

7569. "Flashing light signals." Naamlooze Vennootschap Machinerieen-En Apparaten Fabrieken. March 22nd, 1933. (410725.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from June 6th:—

Gibson Kero Unit (lettering and design). No. 543964. Class 6. Refrigerating machines.—Gibson Electric Refrigerator Corporation, Greenville, Mich., U.S.A. (British representatives: Johnsons, 41, St. Vincent Street, Glasgow.)

Athron. No. 550050. Class 6. Electric welding machines.—J. P. Jackson, trading as the Athro Co., Athro Works, Birmingham Road, The Hayes, Lye, Stourbridge.

Radiomant. No. 548460. All goods in Class 8.—Cheetham & Trevithick, 21, St. Paul's Square, Birmingham.

Electrolethaler. No. 545129. Class 11. Electrical apparatus for anæsthetising animals.—General Radiological & Surgical Apparatus Co., Ltd., 204-206, Great Portland Street, W.1.

O (letter and design). No. 548530. Class 13. Electric lamps (ordinary).—Lilian A. Scales, trading as the Spero Electrical Co., 2, St. John's Lane, E.C.1.

Indian Electrical Imports

THE imports of electrical machinery into India during the year 1933-34 amounted to Rs.127 lakhs in value as against Rs.155 lakhs in the previous year and Rs.216 lakhs in 1931-32. The share of the United Kingdom declined from Rs. 120 lakhs to Rs.86 lakhs, that of Germany remained stationary at Rs.10 lakhs, and the share of the United States increased from Rs.16 lakhs to Rs.17 lakhs. The machinery imported was as follows:—

	1932-33. Rs. lakhs.	1933-34. Rs. lakhs.
Control and switchgear	26	24
Generators, alternators and dynamos	19	13
Motors	24	26
Transformers	18	12
Turbo-generating sets	4	2
Others	62	49

The imports of electrical instruments and apparatus amounted in the year to Rs.230 lakhs as against Rs.234 lakhs in the previous year. The share of the United Kingdom rose from Rs.121 lakhs to Rs.130 lakhs, Germany declining from Rs.34 lakhs to Rs.25 lakhs, the United States from Rs.26 lakhs to Rs.23 lakhs, and Japan from Rs.16 to 15 lakhs. The imports of electric fans fell from Rs.22 lakhs to Rs.19 lakhs, electric wires rose from Rs.58 to 63 lakhs, telegraph and telephone instruments and apparatus from Rs.5 to 12 lakhs, electric lamps from Rs.14 to 15 lakhs, vacuum electric bulbs stood unchanged at Rs.16 lakhs, batteries increased from Rs.12 to 13 lakhs, switchboards from Rs.2 to 3 lakhs, and miscellaneous fell from Rs.41 to 34 lakhs. There was decline in the imports of accumulators, electric lighting accessories and meters.

The imports of wireless apparatus were valued at Rs.10,13,000 as against Rs.10,37,000 in the previous year. The imports from the United Kingdom fell from Rs.8,39,000 to Rs.5,71,000. The imports from the United States rose from Rs.61,000 to Rs.1,78,000. There was little change in the imports from other countries.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aylesbury.—Houses (50); Fleet & Roberts, Ltd., builders.

Ayr.—Premises, High Street, for Marks & Spencer, Ltd. (£12,000); the manager.

Ayrshire.—Remodelling Bank Street School, Irvine (£19,090), for County E.C.; W. Reid, county architect, Ayr.

Bilston.—Houses (426); borough surveyor.

Birmingham.—Factory, Berkeley Street, for the British Oxygen Co.; A. J. Teal, builders, Thimble Mill Lane.

Bolton.—Houses (40), Smithills Estate; Reddy & Southern. Cinema, Crompton Way; H. Crossley. Reconstruction of steel houses, Union Road (£14,700); borough engineer.

Boston.—Houses (100), Tattershall Road; D. G. Cockerill, borough surveyor.

Bristol.—Secondary school (£80,000) for E.C.; W. H. Watkins, architect, 1, Clare Street.

Bromley (KENT).—Extensions to Bromley Palace to form Stockwell Training College (£40,000); R. Robertson, architect, London.

Bury.—Town hall (£220,000) for Corporation.

Canterbury.—School, Wincheap, for City E.C.; director of education.

Cardiff.—Houses (200), Tremorfa Estate, and 162 houses, Ely Estates; city engineer.

Chadderton.—School, the Roughs, for E.C.

Chertsey.—Houses (282), Woodham Lodge Farm Estate; Chessington Hall Estates, Ltd.

Cheshire.—Council senior mixed school, Poynton (£10,088); F. Anstead Brown, county architect, The Castle, Chester.

Chester-le-Street (DURHAM).—Houses (50), Chester Moor; U.D.C. surveyor.

Cleckheaton.—Houses (50), Westfield Lane, for A. Briggs.

Colchester.—Electricity showrooms, &c., York Street, Manningtree; H. Collins, borough engineer.

Corby.—Cinema and shops, High Street, for the Peterborough Estates, Ltd.; A. W. Ruddle, architect, Long Causeway Chambers, Peterborough. Cinema, Rockingham Road, for Stewarts & Lloyds, Ltd.; L. M. Gotch, architect, 1, Paternoster Row, London, E.C.4.

Coulsdon.—Houses (675), Fairdean Heights Estate; Gunton & Gunton. Houses (143), Kingswood Estate; S. P. Chapple & Co.

Coventry.—Factory, Fletchamstead Highway, for the Coventry Swaging Co., Ltd., White Friars Lane.

Crompton.—Houses (35); F. T. Jones, surveyor, Shaw, near Oldham.

Derby.—Police court buildings (£54,119); borough surveyor.

Dorking.—Houses (60), Betchworth; U.D.C. surveyor.

Dudley.—Houses (362), Bunns Lane; borough surveyor.

Durham.—Houses (35), Ludworth; W. B. Cooper & Sons, builders, Sans Street South, Sunderland. Houses (107), Sherburn; G. H. Pearson, builder, Hetton-le-Hole.

Ebbw Vale.—Houses (40); J. Morgan, builder, Neath.

Eccles (LANCS).—Houses (30); borough surveyor. School, Sutherland Street, for E.C.

Essex.—Senior boys' and girls' school, &c., Havering Road, Romford, for County E.C.; J. Sargent, director of education, Chelmsford.

Eton.—Houses (110), Horton Road site, Colnbrook; R.D.C. surveyor.

Glasgow.—Houses (123), Govan; 232 houses at Blochairn and 722 at Blackhill; housing director.

Gloucester.—Houses (82), Tredworth (electrical work); city surveyor.

Gosport.—Houses (76), Seafield; John Hunt, Ltd., builders, Cleveland Road.

Grays.—Houses (60); H. S. Goodall, U.D.C. surveyor, 57, High Street.

Hanley.—Houses (20), Albany Road; J. Jackson.

Haydock.—Houses (42); U.D.C. surveyor.

Ilfracombe.—Reconstruction of Orchestral Hall (£10,000); U.D.C. surveyor.

Inverness-shire.—Schools, Dalneigh, Inverness (£38,730), for County E.C.; director of education, the Castle, Inverness.

Irish Free State.—(BALLINASLOE, CO. GALWAY).—Houses (60); J. L. Dunne, town surveyor. (DUBLIN).—Technical institute, Marino, for the Vocational E.C., Bolton Street; Robinson & Keefe, architects, 8, Merrion Square, Dublin. (Co. KILKENNY).—Technical School, Listerlin, for County Kilkenny Vocational E.C.; T. Kelly, Kilkenny. (CASTLEBAR, Co. MAYO).—Electrical installation at the Assistant Medical Officer's and Resident Medical Superintendent's houses, District Mental Hospital, for the Committee of Management; P. J. Munden, electrical engineer, 1, South Frederick Street, Dublin. (NEW ROSS, Co. WEXFORD).—Fever hospital for Wexford Board of Health; McDonnell Dixon, & Downes, architects, 20, Ely Place, Dublin.

Johnstone.—Houses (500); W. B. Mitchell, burgh surveyor, 9, Collier Street.

Kendal.—Houses, Spital Farm, Grayrigg Road; T. C. Pattinson.

Kent.—Extensions, King Edward Avenue Hospital, Dartford (31,370), for C.C.; clerk, Maidstone.

Lancashire.—Schools, Fulwood, Farington, Orrell, Westhoughton, Kearsley, Whitefield, Great Crosby, Huyton, Newton-in-Makerfield, and Earlstown, for County E.C.; director of education, Preston.

Lincoln.—School, Addison Drive, St. Giles, for City E.C.; Watkins & Coombes, architects, St. Edmond's Chambers.

Liverpool.—Houses (737) in the next twelve months; Middleton & Co., building contractors, Blackpool.

Liversedge.—Houses (80), Lumb Lane, for F. Willis.

London.—(HOLBORN).—Improvement to poor law institution (£14,185.); L.C.C. architect. (KENSINGTON).—Buildings for John Barker & Co., Ltd. (£500,000). (LEWISHAM).—Houses (219), Woodyates Estate; A. J. Butcher. (ST. PANCRAS).—Tenements, Ossulton Estate (£30,062); A. E. Symes, Ltd. (WOOLWICH).—Cemetery chapel, lodge, &c. (£11,666), Eltham; borough engineer.

Luton.—Houses (52) and bungalows; H. Pickering, R.D.C. surveyor, 73, West Parade, Dunstable.

Maidstone.—Houses (38); Cooper Estates, Ltd.

Manchester.—Houses (300), Burton Lane Estate, Droylsden; J. Maunders & Sons, 21, Grange Avenue, Stretford. Houses (250), Slack Road, Blackley; J. Saxon, builder, Cheadle Road, Cheadle Hulme, Stockport. Extensions, St. Clare's School; Catholic trustees.

Maybole (AYRSHIRE).—Houses (40), Dailly Road; J. M. Johnstone, burgh surveyor, Town Hall.

Melton Mowbray.—Houses (50); U.D.C. surveyor.

Middlesex.—Extension, Redhill County Hospital (£251,500), for C.C.

Nantwich.—Houses (400), Gresty, for Ogden & Co., Manchester, and Mr. Davenport, Shavington.

Newburn-on-Tyne.—Houses (194), Throckley; J. H. Wetherley, surveyor, Council Offices.

Newcastle-on-Tyne.—Houses (450); R. G. Roberts, housing architect, Town Hall.

Northallerton.—Houses (80); U.D.C. surveyor.

North Riding.—Girls' school, Sandybed, Scarborough, for County E.C.

Orrell (LANCS).—Houses (92), Sandy Lane; U.D.C. surveyor.

Oxford.—Theatre, near Gloucester Green; Union Theatres (Oxford), Ltd.

Peterborough.—School, Wittering, for Soke of Peterborough E.C.; F. J. Lenton, architect.

Pickering (YORKS).—Houses (30); U.D.C. surveyor.

Ripon.—Houses (50), Priest Lane; city engineer.

Rotherham.—Mission church, Browning Road; Whiston Parish Council, Cinema (£20,000); Blackmore, Sykes & Co., architects, Ruskin Chambers, Scale Lane, Hull. Swimming bath and junior school, Coleridge Road, and school for defectives, for Borough E.C.; borough engineer.

Rugby.—Houses (54), and ward block, Harborough Magna Isolation Hospital (£5,000); R.D.C. surveyor. Houses (40) and bungalows; borough surveyor.

St. Helens.—Houses (196), Grangepark site; borough surveyor. Houses (20), Woodlands Road, for W. C. Harris, junior.

Sanderstead.—Houses (37), Limpsfield Road; H. Williams Holiday and Partners. Houses (324), Old Farleigh Estate; R. Costain, Ltd.

Sheffield.—Houses (30), Poole Place; W. & E. Sadler. Houses (86), Shiregreen Estate (£28,457); W. Malthouse, Ltd. Extensions, City General Hospital; city architect. Extensions, Shoreham Street Bus depot; city engineer.

Smethwick.—Extensions, Dartmouth Road; Birmingham Aluminium Casting Co., Ltd.

Southall.—Houses (40), St. Crispins Close; G. Wimpey & Co., Ltd. Town Hall, competition; Council clerk.

South Queensferry.—R.C. Church; Priest-in-charge.

South Shields.—Houses (50), Mortimer Road, Cauldwell Avenue, Cauldwell Villas, Page Avenue, and Warwick Road; Henderson Brothers, builders, Smith Street, Tyne Dock.

Stafford.—Conversion of rectory into senior schools (£9,000), for St. Mary's School Managers; Rev. Lionel Lambert, rector.

Staffordshire.—Two senior schools, Sedgley, for County E.C.; director of education, Stafford.

Stockport.—Cinema, to be known as the "Savoy," Compstall Road, Romiley, for a local syndicate (£10,000); R. G. Tarran, builder, Ryde Avenue, Hull.

Stockton-on-Tees.—Cinema, High Street (2,150 seats); T. Clayton, architect, High Row, Darlington.

Stornoway.—Reconstruction of Nicolson Institution; county clerk.

Stourbridge.—Houses (140); F. Woodward, borough engineer.

Surrey.—Schools, Epsom and Moor Lane, Chessington, Surbiton, for County E.C.; secretary, Grange Road, Kingston-on-Thames.

Sutton Coldfield.—Houses (42), Holland House Estate (£13,295); Streathers, Ltd.

Swindon.—Houses (29), Scarborough Road; A. J. Colborne.

Tadcaster.—Houses (40), Auster Bank; R.D.C. surveyor.

Thurso.—Houses (82), Glebe site; Sinclair, Macdonald & Son.

Tickhill (YORKS).—Houses (26); J. Haslam, U.D.C. surveyor.

Wallsend.—Houses (53), Westlands Estate, for the Northern Homes and Estates, Ltd.; W. Riddle, architect, 53, Denham Terrace.

Warlingham.—Houses (26), Thriftfield Estate; P. Adams, architect.

West Riding.—Infants' school, Newall Carr Road, Otley, for County E.C.

Wigan.—Grammar school (£43,140), for Borough E.C.; A. E. Munby, architect, London.

Willenhall.—Houses (178), Moseley Road; Marshall & Sons. Houses (46), Pooles Lane; Collins & White.

Wolverhampton.—Cinema, Stafford Road, Bushbury, for Dunstall Picture House, Co. R. C. schools (£6,500), Hickman Avenue; John McLean, Ltd., Coven, builders.

Worcester.—Extensions to public library and museum (£6,139); Thomas Broad, Ltd., builders, Malvern.

Workington.—Church, Salterbeck; South William Street Methodist trustees. Electricity showrooms and offices (£10,000); borough surveyor.

Worthing.—Houses (26), Drummond Road; A. G. Keatch. Houses (38), Offington Drive, &c.; R. Hasler. Houses (30), Southfarm Road; L. A. Terry, Ltd. Church, Pendine Avenue; East Worthing Evangelical Free Church Council. Cinema, Bath Place; S. H. Burwood, 80, George Street, London, W.1.

Yeovil.—Houses (34); Petter & Warren, architects, Old Sarum.